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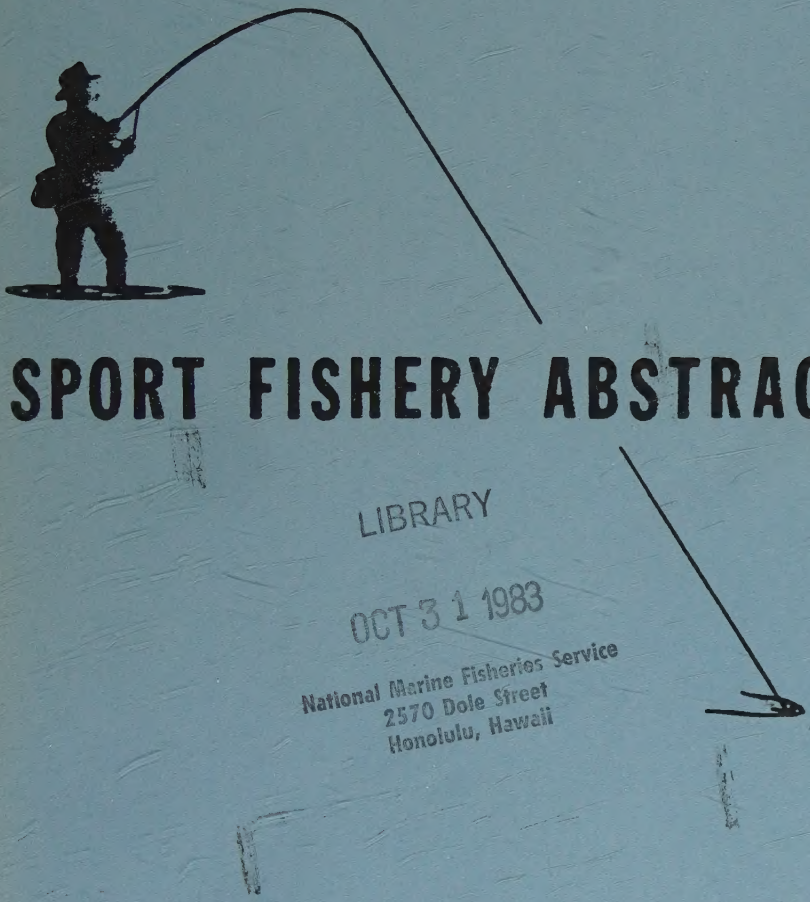

SPORT FISHERY ABSTRACTS

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Vol. 28, No. 3, 1983

DEPARTMENT OF THE INTERIOR
U. S. FISH AND WILDLIFE SERVICE

UNITED STATES DEPARTMENT OF THE INTERIOR

SPORT FISHERY ABSTRACTS

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Editorial Office
U.S. Fish and Wildlife Service
Aylesworth Hall, CSU
Fort Collins, Colorado 80523

Sport Fishery Abstracts is intended to furnish fishery biologists with abstracts of current literature in sport fishery research and management.

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SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

Volume 28(3) 1983

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GENERAL FISH CULTURE

83-001295 Clark, E. R. and J. A. L. Fraser. THE SURVIVAL AND GROWTH OF SIX SPECIES OF FRESHWATER FISH, IN TAPWATER AND DILUTED AND UNDILUTED EFFLUENT FROM SEWAGE PERCOLATING FILTERS. *J. Fish Biol.* 22(4):431-445. Apr. 1983. SFA 28(3)

[Dep. Chem., Univ. Aston, Birmingham B4 7ET, England] The survival and growth of rainbow trout, *Salmo gairdneri* Richardson, stone loach, *Noemacheilus barbatulus* (L), bullhead, *Cottus gobio* L., three-spined stickleback, *Gasterosteus aculeatus* L., minnow, *Phoxinus phoxinus* (L), and roach, *Rutilus rutilus* (L), have been studied in water of three qualities--Birmingham tap water, 50% and 100% settled effluent from filter beds. Predicted toxicities (the sum of the proportions of the 48-h LC50 of individual poisons to rainbow trout) were compared with the observed toxicity in 50% and 100% effluent. The behaviour of each species of fish and the rates of mortality over an exposure period of 210 days are given together with cumulative growth rates (as a percentage of the initial weight). The Mean Percentage Change in Weight (MPW) and Mean Growth Rate (MGR) for each group of fish was calculated from the initial mean wet weight and the mean weight of surviving fish at the end of the first and second intervals. The Mean Production Rate (MPR) over the experimental period was also calculated and was used as a holistic measure of the rate of total tissue elaboration or utilization, or loss in biomass due to mortality. The Condition Factor (K) also reported was calculated from the body weight and length and was used to examine (a) the effects of water quality, and (b) the timing and duration of maturation of the gonads. The latter was further used as a measure of the energy status of the fish.

83-001296 Doyle, R. W. AN APPROACH TO THE QUANTITATIVE ANALYSIS OF DOMESTICATION SELECTION IN AQUACULTURE. *Aquaculture* 33(1-4):167-185. June 1983. SFA 28(3)

[Dep. Biol., Dalhousie Univ., Halifax, NS B3H 4J1, Canada]

83-001297 Kincaid, H. L. INBREEDING IN FISH POPULATIONS USED FOR AQUACULTURE. *Aquaculture* 33(1-4):215-227. June 1983. SFA 28(3)

[U.S. FWS, Box 700, Kearneysville, WV 25430]

83-001298 Wohlfarth, G. W. GENETICS OF FISH: APPLICATIONS TO WARM WATER FISHES. *Aquaculture* 33(1-4):373-381. June 1983. SFA 28(3)

[Agric. Res. Organ., Fish Aquacult. Res. Stn., Dor, Israel]

TROUT AND SALMON CULTURE

83-001299 Bams, R. A. EARLY GROWTH AND QUALITY OF CHUM SALMON (*ONCORHYNCHUS KETA*) PRODUCED IN KEEPER CHANNELS AND GRAVEL INCUBATORS. *Can. J. Fish. Aquatic Sci.* 40(4):499-505. Apr. 1983. In English with French summ. SFA 28(3)

[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

83-001300 Billard, R. EFFECTS OF COELOMIC AND SEMINAL FLUIDS AND VARIOUS SALINE DILUENTS ON THE FERTILIZING ABILITY OF SPERMATOZOA IN THE RAINBOW TROUT, *SALMO GAIRDNERI*. *J. Reprod. Fert.* 68(1):77-84. May 1983. SFA 28(3)

[I.N.R.A., Lab. Physiol. Poissons, Campus de Beaulieu, 35042 Rennes, France] When trout (*Salmo gairdneri*) spermatozoa diluted in coelomic fluid or saline diluents at high dilution rates of 10^{-3} and

TROUT AND SALMON CULTURE (CONTINUED)

83-001300 CONTINUED 10^{-2} for increasing periods of time before insemination, there was a rapid decline and loss of fertilizing ability. At a lower dilution rate of 10^{-1}, there was partial or no loss of fertility. Dilution in a KCl-enriched saline diluent to inhibit sperm motility produced a slight decrease in fertility at a 10^{-3} dilution rate, indicating that the spermatozoa, although sensitive to dilution, were less so when they were kept immotile. A partial loss of fertility was observed after the spermatozoa or eggs had been washed with saline diluents. The loss of fertility was total when both gametes were washed. Removing the seminal fluid by centrifugation led to significant decrease in the fertilizing ability of the spermatozoa when insemination was carried out in saline diluent but not in coelomic fluid. Adding BSA at high doses (10 mg BSA/ml) into the diluent led to longer survival of the diluted spermatozoa. We conclude that (1) sperm dilution rate is a major factor in the maintenance of fertilizing ability of diluted salmonid spermatozoa, (2) as reported in the literature, coelomic fluid is superior to mineral diluents only when the gametes have been washed, and (3) some substances (possibly proteins) present in seminal and coelomic fluids play a role in gamete protection. These findings may explain the discrepancies in the literature concerning the duration of motility and fertilizing ability of salmonid spermatozoa.

83-001301 Bondari, K. GENETIC AND ENVIRONMENTAL CONTROL OF FINGERLING SIZE IN CHANNEL CATFISH. *Aquaculture* 34(1-2):171-176. July 1983. SFA 28(3)

[Coastal Plain Exp. Stn., Univ. Ga., Tifton 31793] The 360 channel catfish fingerlings used in this study were from three full-sib families (120/family) hatched in the summer of 1980. Forty fish (20 ♀ and 20 ♂) per size-class (large, medium, and small) were visually selected from each full-sib family. Half the fish in each size-class within each family were fed a commercial high protein diet (37.5%) and the other half a commercial low protein diet (32.0%). Catfish from the large, medium and small size-classes fed the high protein diet for 20 weeks gained 86, 46, and 63% more weight than their full-sibs fed the low protein diet, respectively. The small size-class fingerlings fed the low protein diet for 20 weeks weighed only 24% as much as the large size-class fingerlings fed the high protein diet. Results indicated that economic management of catfish fingerlings should include visual sorting of the fingerlings and feeding according to their size and sex. The smaller fingerlings should be eliminated by selection from within-family due to their high mortality and low growth rate. Continuation of the study for an extra 10 weeks with only the high protein diet fed to all sex groups indicated the strongest compensatory growth was for the small size-class catfish previously on the low protein diet. This study demonstrates that catfish size is not strictly genetically controlled and can be altered by protein intake.

83-001302 Gras, J.; J. F. Aldrin; Y. Gudefin; F. Chagny and H. Perrier. EFFECT OF PROTEIN SUPPLEMENT ON BLOOD PLASMA AMINO ACIDS OF COHO SALMON IN CULTURE IN SEAWATER DURING SUMMER. *Aquaculture* 32(3-4):397-400. May 1983. SFA 28(3)

[Natl. Lab. Aquatic Anim. Pathol., Oceanogr. Cent. Brittany, BP337, 29273 Brest Cedex, France] Coho salmon, *Oncorhynchus kistuch*, age 1 year (1+), were held in seawater in floating cages on the Brittany coast during summer 1980. A supplemental feed containing soluble protein and ascorbic acid was given to prevent the high mortality which occurs at this time of year. Blood plasma amino acids of control and supplemented animals were evaluated by ion exchange chromatography. Results indicated that ornithine, alanine, valine, isoleucine, leucine and tyrosine levels increase during summer, whereas histidine decreases. Supplementation for 50 days did not affect these changes, but after 90 days the amino acid pattern of supplemented animals approached the initial control. Supplemental feeding did not diminish

TROUT AND SALMON CULTURE (CONTINUED)

83-001302 CONTINUED mortality (85%) which is thus probably not related to exhaustive proteolysis but rather to environmental factors or undetected infection.

83-001303 Hunter, G. A.; D. M. Donaldson; J. Stoss and I. Baker. PRODUCTION OF MONOSEX FEMALE GROUPS OF CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA*) BY THE FERTILIZATION OF NORMAL OVA WITH SPERM FROM SEX-REVERSED FEMALES. *Aquaculture* 33(1-4):355-364. June 1983. SFA 28(3)
[West Vancouver Lab., 4160 Marine Dr., West Vancouver, BC V7V 1N6, Canada]

83-001304 Jensen, J. O. T. and D. F. Alderdice. CHANGES IN MECHANICAL SHOCK SENSITIVITY OF COHO SALMON (*ONCORHYNCHUS KISUTCH*) EGGS DURING INCUBATION. *Aquaculture* 32(3-4):303-312. May 1983. SFA 28(3)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

83-001305 Jobling, M. and A. Wandsvik. EFFECT OF SOCIAL INTERACTIONS ON GROWTH RATES AND CONVERSION EFFICIENCY OF ARCTIC CHARR, *SALVELINUS ALPINUS* L. *J. Fish Biol.* 22(5):577-584. May 1983. SFA 28(3)
[Inst. Fiskerifag, Univ. Tromsø, 9001 Tromsø, Norway] Mixing of fish from size-graded groups did not have detrimental effects on subsequent growth performance as compared with control groups. Coefficients of variance for size, within each population, increased with time demonstrating that social interactions were influencing the growth rates of some individuals. Rates of growth of large fish were higher than those of small indicating the growth of the small fish was suppressed below its potential maximum. The results are discussed in relation to those of previous studies and it is concluded that inferences drawn from changes in coefficients of variance have frequently been incorrect.

83-001306 Knowles, A. H. and R. H. Rines. ENVIRONMENTAL CONDITIONING PROCESS OF ACCELERATING AND CONTROLLING THE DEVELOPMENT OF SALMON SMOLT AND SUBSEQUENT SALT WATER MATURATION. *J. World Maricult. Soc.* 12(2):96-97. 1981. SFA 28(3)
[KR Assoc., New England Fish Farm. Enterprises, Inc., 1 Maple St., Concord, NH 03301]

83-001307 Linder, D.; O. Sumari; K. Nyholm and S. Sirkkomaa. GENETIC AND PHENOTYPIC VARIATION IN PRODUCTION TRAITS IN RAINBOW TROUT STRAINS AND STRAIN CROSSES IN FINLAND. *Aquaculture* 33(1-4):129-134. June 1983. SFA 28(3)
[Dep. Anim. Breeding, Univ. Helsinki, Helsinki, Finland] Variation in body weight was analyzed among 1979 1-year-old fishes (progeny of four dams and five sires). The coefficient of variation was 0.39. The variance component estimated for dams by a least squares analysis of variance was lower than that estimated for sires. The heritability of body weight calculated from the dam component was 0.10 ± 0.08, from the sire component 0.38 ± 0.25. The variation in several characters (body weight, carcass quality) was studied in crosses between five strains of rainbow trout. The coefficients of variation ranged between 0.16 and 0.33. With regard to the pure strains the mean body weight at 2 years (24 months) and three summers (32 months) of age was significantly greater for the Kamloops strain than that for the most commonly used Danish strain. With regard to strain crosses the combinations containing Kamloops seemed to be slightly better than those without it. The analysis of variance with regard to carcass quality parameters showed significant differences between the strains at 2 years of age.

TROUT AND SALMON CULTURE (CONTINUED)

83-001308 Soderberg, R. W.; J. B. Flynn and H. R. Schmittou. EFFECTS OF AMMONIA ON GROWTH AND SURVIVAL OF RAINBOW TROUT IN INTENSIVE STATIC-WATER CULTURE. *Trans. Am. Fish. Soc.* 112(3):448-451. May 1983. SFA 28(3)
[Fish Cult. Prog., Dep. Biol., Mansfield Univ. Pa., Mansfield 16933]

83-001309 Sower, S. A.; C. B. Schreck and M. Evenson. EFFECTS OF STEROIDS AND STEROID ANTAGONISTS ON GROWTH, GONADAL DEVELOPMENT, AND RNA/DNA RATIOS IN JUVENILE STEELHEAD TROUT. *Aquaculture* 32(3-4):243-254. May 1983. SFA 28(3)
[Dep. Zool., Univ. Wash., Seattle 98195] Steroids incorporated into Oregon Moist Pellets were fed to steelhead trout (*Salmo gairdneri*) to determine if growth could be enhanced. We conclude from these studies that steelhead trout do not respond positively in terms of growth enhancement from steroid treatment as has been shown in other salmonids. However, the androgen antagonist, flutamide, may be a potential growth enhancer in the steelhead trout and may also be used as an antiandrogenic compound when administered with an androgen.--from abstr.

83-001310 Wertheimer, A. C.; W. R. Heard and R. M. Martin. CULTURE OF SOCKEYE SALMON (*ONCORHYNCHUS NERKA*) SMOLTS IN ESTUARINE NET PENS AND RETURNS OF ADULTS FROM TWO SMOLT RELEASES. *Aquaculture* 32(3-4):373-381. May 1983. SFA 28(3)
[NMFS, P.O. Box 155, Auke Bay, AK 99821] In 1973, adult sockeye salmon, *Oncorhynchus nerka*, were transported from Nakvassin Creek, Baranof Island, southeastern Alaska, to a nearby research station and hatchery at Little Port Walter. Progeny from these fish were used for the study. The fry were initially cultured in freshwater, then transferred to an estuarine net pen as fingerlings (6.7 g) on 31 October 1974 for overwinter culture in seawater. Survival of the fingerlings from transfer until 21 April 1975 was 97%. Two groups of smolts were released from the net pen in 1975: an early group on 22 April and a late group on 7 June. The age, sex ratios, and size of returning adults from the two release were similar. The proportion of the returning adults from each group, however, was significantly different ($F0.001$): 9.2% of the later release group returned versus 4.0% of the earlier release group. Most of the transplanted fish returned to Little Port Walter; however, some adults strayed between Little Port Walter and Nakvassin Creek.

WARMWATER CULTURE

83-001311 Bondari, K. RESPONSE TO BIDIRECTIONAL SELECTON FOR BODY WEIGHT IN CHANNEL CATFISH. *Aquaculture* 33(1-4):73-81. June 1983. SFA 28(3)
[Dep. Entomol. Fish., Coastal Plain Exp. Stn., Univ. Ga, Tifton 31793] Brood channel catfish used in this experiment were the first generation progeny of a base population originating from six different hatcheries in Georgia, Alabama, and Mississippi. Between and within family selections for body weight were performed at 40 weeks of age in the upward (W^+) and downward (W^-) directions. Five-year old females and males from the two divergent lines were pair-mated in all four possible combinations to produce the first generation offspring. A randombred control line was also maintained to monitor the growth and survival in the four direct and reciprocal lines. The total of 16 spawns produced for this study were artificially hatched and the fish were reared in indoor tanks for 40 weeks and in cages for 48 weeks thereafter to determine the response to bidirectional selecton for body weight. Body weight changes, measured as deviations from the control line, were about 20% in either direction at the end of the cage and tank tests. Total length difference between the upward and downward lines was 13%. Catfish produced from ♀(W^+) X ♂(W^-) line were comparable

WARMWATER CULTURE (CONTINUED)

83-001311 CONTINUED in growth to those from ♀(W^+) X ♂(W^+) line but differed significantly from ♀(W^-) X♂(W^+). The ♀(W^-) brood should not be used in fingerling production. Realized heritability estimates for body weight and total length were considerably lower than those estimated from full- and half-sib components of variance.

83-001312 Calhoun, W. E. and W. L. Shelton. SEX RATIOS OF PROGENY FROM MASS SPAWNINGS OF SEX-REVERSED BROODSTOCK OF *TILAPIA NILOTICA*. *Aquaculture* 33(1-4):365-371. June 1983. SFA 28(3)
[Auburn Univ., Sea Grant Advis. Serv., Mobile, AL 36609]

83-001313 Dunham, R. A. and R. O. Smitherman. RESPONSE TO SELECTION AND REALIZED HERITABILITY FOR BODY WEIGHT IN THREE STRAINS OF CHANNEL CATFISH, *ICTALURUS PUNCTATUS*, GROWN IN EARTHEN PONDS. *Aquaculture* 33(1-4):89-96. June 1983. SFA 28(3)
[Dep. Fish. Allied Aquacult., Ala. Agric. Exp. Stn., Auburn Univ., AL 36849] Response to selection and realized heritability for body weight were determined for three strains of channel catfish grown in earthen ponds at 7500/ha. The strains--Rio Grande (Texas), Marion (Alabama), and Kansas, (Kansas)--had different histories of domestication, 10 years, 20 years, and 60 years, respectively. At a harvest weight of approximately 500 g, the largest 10% of each population was selected. The growth performance of progeny from selected fish was compared to that of progeny from randomly chosen fish. Significant responses to selection ($P < 0.001$) of 63, 73, and 54 g(17, 18, and 12% increase in body weight) were obtained from Rio Grande, Marion, and Kansas strains, respectively. Response was higher for Marion than for Kansas ($P < 0.001$) and Rio Grande ($P < 0.05$). Generally, the fish with shorter periods of domestication had greater response. Realized heritability for Marion, 0.50 ± 0.13, was higher ($P < 0.01$) than that for Rio Grande, 0.24 ± 0.06. Kansas, 0.33 ± 0.10, did not differ ($P > 0.05$) from Rio Grande or Marion. Responses for male and female body weights were the same in Marion ($P > 0.05$) but responses by Kansas males was higher than that for Kansas females ($P < 0.05$) . There were no significant differences in realized heritabilities for male and female body weights ($P > 0.05$).

83-001314 Dunham, R. A.; R. O. Smitherman; J. L. Horn and T. O. Bice. REPRODUCTIVE PERFORMANCES OF CROSSBRED AND PURE-STRAIN CHANNEL CATFISH BROOD STOCKS. *Trans. Am. Fish. Soc.* 112(3):436-440. May 1983. SFA 28(3)
[Dep. Fish. Allied Aquacult., Ala. Agric. Exp. Stn., Auburn Univ., AL 36849]

83-001315 Duvarova, A. S. OOCYTE MATURATION IN THE SILVER CARP, *HYPOPHTHALMICHTHYS MOLITRIX* (CYPRINIDAE), AFTER HORMONAL STIMULATION. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(5):76-84. 1982. SFA 28(3)
[Biol. Fac., Moscow Univ., USSR]

83-001316 Eyeson, K. N. EGG AND FRY SWALLOWING HABITS OF TILAPIA. *Aquaculture* 32(3-4):415-418. May 1983. SFA 28(3)
[Dep. Zool., Univ. Cape Coast, Cape Coast, Ghana] Samples of tilapia obtained from three lagoons were examined for the presence of eggs and fry in the stomach. This occurred in 8-15% of brooders of *Sarotherodon melanotheron*, and appeared incidental to oral brooding. In a sample of

WARMWATER CULTURE (CONTINUED)

83-001316 CONTINUED *Tilapia zillii*, a guarder species, about 67% had swallowed large numbers of fry; this poses a problem to commercial production of fry. The egg and fry swallowing habit of these species seems associated with emotional disturbance.

83-001317 Gabel, S. J.; J. W. Avault, Jr. and R. P. Romaire. POLYCULTURE OF CHANNEL CATFISH (*ICTALURUS PUNCTATUS*) WITH ALL-MALE TILAPIA HYBRID. *J. World Maricult. Soc.* 12(2):153-162. 1981. SFA 28(3)
[La. Agric. Exp. Stn., La. State Univ., Baton Rouge 70803]

83-001318 Harvey, B. CRYOPRESERVATION OF *SAROTHERODON MOSSAMBICUS* SPERMATOZOA. *Aquaculture* 32(3-4):313-320. May 1983. SFA 28(3)
[Dep. Biol., Univ. Victoria, P.O. Box 1700, Victoria, BC V8W 2Y2, Canada] A method for the cryopreservation of spermatozoa from *Sarotherodon mossambicus* is described in which 5% methanol and 15% milk powder served as cryoprotectants. Post-thaw motility is roughly double that obtained by substituting 5% or 10% DMSO for methanol. Data detailing cryoprotectant concentration optima, cooling and warming rate optima, the effect of dilution and of equilibration time are presented. In fertility tests, cryopreserved sperm yielded 64.3 ± 34.2% of embryos developing to the stage of blastopore closure, compared with 57.5 ± 10.5% for control, unfrozen milt.

83-001319 Liaw, W. K. GROWING WALLEYE FINGERLINGS IN SMALL LAKES. *Blue Jay* 41(2):80-82. June 1983. SFA 28(3)
[Saskatchewan Fish. Lab., 30 Campus Dr., Saskatoon, SK S7N 0X1, Canada]

83-001320 Mallatt, J. LABORATORY GROWTH OF LARVAL LAMPREYS (*LAMPETRA (ENTOSPHENUS) TRIDENTATA* RICHARDSON) AT DIFFERENT FOOD CONCENTRATIONS AND ANIMAL DENSITIES. *J. Fish Biol.* 22(3):293-301. Mar. 1983. SFA 28(3)
[Dep. Zool., Wash. State Univ., Pullman 99164] Lampreys are important research animals. This study investigates some of the parameters important for culturing the suspension feeding larvae: food concentration, temperature and crowding. Large larvae (*Lampetra (Entosphenus) tridentata* Richardson) were used, weighing from 1.5 to 3.0 g (wet). Two food types were employed: suspended yeast cells (*Saccharomyces cerevisiae*, 0-20 mg l^{-1} (dry), or, in a few tests, a fine particulate fish food, Liquifry (Interpet LTD, 0-13 mg l^{-1}). At both 14 and 4°C, yeast could sustain weight increases comparable to those in nature: >6% $month^{-1}$ for up to 6 months, the duration of the study. In a single test, a vitamin supplement failed to improve growth on yeast. Growth was fastest at 14°C (+41% $month^{-1}$, max. weight increase), although also substantial at 4°C (+11% $month^{-1}$, max.). Growth could not be sustained at 20°C, due perhaps to difficulty in removing products of food decay from the aquaria. Food level being constant, growth rate varied inversely with animal density. It is suggested that larval lampreys release a growth-inhabiting substance into the sand which they inhabit. Overall, the best growth was obtained at 14°C, with <0.05 g of animal (wet weight) l^{-1}. Liquifry was associated with lowered growth rates when present continually above 4 mg (dry weight) l^{-1} (14°C), although growth did occur at lower concentrations.

83-001321 Mires, D. CURRENT TECHNIQUES FOR THE MASS PRODUCTION OF TILAPIA HYBRIDS AS PRACTICED AT EIN HAMIFRATZ FISH HATCHERY. *Bamidgeh* 35(1):3-8. Mar. 1983. SFA 28(3)
[Minist. Agric., Chief Ext. Off. Fish Farm, Ein Hamifratz, Israel]

WARMWATER CULTURE (CONTINUED)

83-001322 Mollah, M. F. A. and E. S. P. Tan. VIABILITY OF CATFISH (*CLARIAS MACROCEPHALUS*, GUNTHER) EGGS FERTILIZED AT VARYING POST-OVULATION TIMES. *J. Fish Biol.* 22(5):563-566. May 1983. SFA 28(3)

[Sch. Biol. Sci., Univ. Sains Malaysia, Penang, Malaysia] HCG-induced (dose: 2 iu g^{-1} body weight) ovulated eggs of catfish (*Clarias macrocephalus*) remained viable for artificial fertilization up to 10 h post-ovulation without apparent significant loss in fertility. At 12 h post-ovulation viability decreased significantly, showing little or no hatching at 20 h. A limit of 10 h between ovulation and egg-stripping was suggested for this species at an ambient temperature of 26-31°C.

83-001323 Moran, E. C. PRODUCTION AND WATER QUALITY IN MANURED FISH-CULTURE PONDS. *Ph.D. dissertation, Cornell Univ.* 101p. 1983. From Diss. Abstr. Int. B Sci. Eng. 43(12):3850. June 1983. SFA 28(3)

This study examined the production and water quality response of ponds fertilized with anaerobically digested dairy manure. Six ponds were used during two field seasons (1980 and 1981). The effects of three fertilization rates were tested: 5,500 $kg.ha^{-1}.yr^{-1}$, 16,400 $kg.ha^{-1}.yr^{-1}$, and 36,900 $kg.ha^{-1}.yr^{-1}$ (wet weight). Primary productivity, the concentration of solids, and fish yield (*Micropterus salmoides* and *Notemigonus crysoleucas*) were monitored in addition to N and P concentrations and fluxes. Water quality in the ponds was monitored by frequent diel dissolved oxygen studies, and measurements of ammonia levels. Primary productivity was increased by the manure inputs, to mean levels of 0.8-4.0 g $C.m^{-2}.day^{-1}$ in the fertilized ponds versus 0.4-0.6 g $C.m^{-2},day^{-1}$ in the controls. The primary productivity rates in the manured ponds were similar to those reported in other studies. The fish yield, however was low in this study (0.1-1.1 $kg.ha^{-1}.day^{-1}$) as compared to other manure fertilized systems (5-40 $kg.ha^{-1}.day^{-1}$). The differences may reflect the species of fish stocked. Microbial biomass supported by the organic substrates in the manure inputs may contribute significantly to the pond food web this source was calculated at 17% of the total fixed carbon in these experiments. Calculations of N and P flux revealed that P limits production in the unfertilized ponds and in the low-rate ponds (fertilizer at 0 and 0.57 g $P.m^{-2}.yr^{-1}$), but not in the moderate and high rate ponds (1.71 and 3.57 g $P.m^{-2}.yr^{-1}$). N apparently limits production in these ponds. While both N and P are lost from the water column on an annual basis, tests of the short-term cycling of these elements showed that N is lost both more rapidly and more permanently from the pond system. The upper limits on pond fertilization rates are determined by water quality degradation from high ammonia concentrations. The ammonia concentration in a pond can be predicated as a function of manure load; thus, the upper limits on permissable manure inputs can be claculated.

83-001324 Smith, T. I. J.; E. K. Dingley and D. E. Marchette. CULTURE TRIALS WITH ATLANTIC STURGEON, *ACIPENSER OXYRHYNCHUS*, IN THE USA. *J. World Maricult. Soc.* 12(2):78-87. 1981. SFA 28(3)

[Mar. Resour. Res. Inst., P.O. Box 12559, Charleston, SC 29412] In South Carolina, a joint state-federal program was initiated in 1977 to develop spawning and rearing techniques for Atlantic sturgeon, *Acipenser oxyrhynchus*, and to investigate its culture potential. Good progress has been made in developing the hatchery technology. Brood stock collection sites and techniques have been established and suitable transportation and holding procedures demonstrated for these large fish (≅40-100 kg). Homospecific hypophyseal injections were employed successfully to induce two spawnings. The artificially fertilized eggs, incubated in MacDonald hatching jars, hatched in about 120 hours at 17-18°C. Yolk sac was absorbed by day 10 and the fry were weaned on a diet consisting of beef liver and salmon mash supplemented with live *Artemia*. During the second trial, fish hatched at

WARMWATER CULTURE (CONTINUED)

83-001324 CONTINUED 7.8 mm mean total length obtained a size of 176.7 mm in 204 days. Several pond culture studies were undertaken with juvenile sturgeon. Although most fish eventually died (due to poor environmental conditions) some wild-caught juveniles were successfully maintained under pond conditions for about 20 months and one brood female survived for 15 months. Pond-held fish were fed trout chow supplemented with pieces of beef liver. Feeding activity could be observed at night along dike areas.

83-001325 Smitherman, R. O.; R. A. Dumham and D. Tave. REVUE OF CATFISH BREEDING RESEARCH 1969-1981 AT AUBURN UNIVERSITY. *Aquaculture* 33(1-4):197-205. June 1983. SFA 28(3)

[Dep. Fish. Allied Aquacult., Ala. Agric. Exp. Stn., Auburn Univ., AL 36849]

83-001326 Stoss, J. and W. Holtz. CRYOPRESERVATION OF RAINBOW TROUT (*SALMO GAIRDERI*) SPERM. IV. THE EFFECT OF DMSO CONCENTRATION AND EQUILIBRATION TIME ON SPERM SURVIVAL, SURCROSE AND KCl AS EXTENDER COMPONENTS AND THE OSMOLALITY OF THE THAWING SOLUTION. *Aquaculture* 32(3-4):321-330. May 1983. SFA 28(3)

[Dep. Fish. Oceans, 4160 Marine Dr., West Vancouver, BC V7V 1N6, Canada] A series of three experiments was carried out to investigate factors that affect the fertility of frozen-thawed rainbow trout sperm. (1) The concentration of DMSO added to the extender was varied from 5 to 20 ml/100 ml extender and simultaneously the sperm were equilibrated in these extenders for less than 1,2,4 and 60 min. at 0°C. (2) The suitability of sucrose (0, 100, 200 or 300 mmol) and KCl (0, 6.7, 13.4, 20.2, 26.9 or 33.6 mmol) as extender components was tested. (3) By varying the concentration of the thawing solution ($NaHC0_3$), the effect of osmotic pressure in the thawed sperm-thawing solution suspension was investigated. DMSO concentrations between 10% and 20% provided high post-thaw fertility (77%) when sperm equilibration time was kept at a minimum. With increasing DMSO concentration, the detrimental effect of any equilibration time was more pronounced. Sucrose did not influence the fertility of cryopreserved sperm in the presence of KCl. The use of 6.7 mmol KCl showed a slight advantage over KCl-free extenders. The absence of sucrose and KCl resulted in reduced sperm survival. Sperm thawed in solutions of different ionic strength had the highest fertility (85%) at the lowest osmolality tested (249 mOsm). Fertility dropped significantly with increasing osmolality to a lowest level of 61% at 365 mOsm.

83-001327 Tikare, D. K.; S. A. Nevagi and V. B. Nadkarni. INDUCTION OF OVULATION AND SPAWNING IN THE CATFISH, *CLARIAS BATRACHUS* (L.) BY PROSTAGLANDIN F_2a. *Experientia (Basel)* 39(4):356. 15 Apr. 1983. SFA 28(3)

[V.B. Nadkarni: Dep. Zool., Karnatk Univ., Dharwad-580 003, India] Administration of low doses of prostaglandin F_2a (PGF_2a), i.e. 10 and 100 mg/g b.wt, was ineffective in inducing ovulation and spawning in mature catfish. However, doses of 200 ng/g b.wt of PGF_2a elicited partial response, and 500 ng/g b.wt of PGF_2a induced profuse ovulation and spawning similar to that induced by administration of human chorionic gonadotropin (HCG).

83-001328 Waas, B. P.; K. Strawn; M. Johns and W. Griffin. THE COMMERCIAL PRODUCTION OF MUDMINNOWS (*FUNDULUS GRANDIS*) FOR LIVE BAIT: A PRELIMINARY ECONOMIC ANALYSIS. *Tex. J. Sci.* 35(1):51-60. Mar. 1983. SFA

WARMWATER CULTURE (CONTINUED)

83-001328 CONTINUED 28(3)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843] The economic feasibility of operating a commercial mudminnow farm was determined using the Generalized Budget Simulation Model for Aquaculture developed at Texas A&M University. A 10-yr planning horizon was used for the study. Initial investment costs, annual budgets and cash flows were estimated to determine cost, returns and profit. Economic profit, break-even analysis and net present value were used to evaluate the economic feasibility. Based on a grow-out stocking density of 400,000/ha, 85% projected survival, 3 crops per year and achieved production at 80% of capacity, the 24-ha facility showed an economic profit of $41,160 for the 6th year of operation. The break-even price of $0.40/dozen was $0.25 less than the market price of $0.65. The break-even production of 278,705 dozen/yr is 174,629 dozen less than the assumed annual production of 453,334 dozen.

83-001329 Wohlfarth, G. W.; R. Moav and G. Hulata. A GENOTYPE-ENVIRONMENT INTERACTION FOR GROWTH RATE IN THE COMON CARP, GROWING IN INTENSIVELY MANURED PONDS. *Aquaculture* 33(1-4):187-195. June 1983. SFA 28(3)
[Fish Aquacult. Res. Stn., Dor, Hof Hacarmel, Israel]

MARICULTURE

83-001330 Barahona-Fernandes, M. H. and M. T. Dinis. REARING AND ONGROWING OF DOVER SOLE (*SOLEA SOLEA* L.) UNDER LABORATORY CONDITIONS. *Arq. Mus. Bocage Ser. B* 2(4):19-28. 1982. SFA 28(3)
[Dep. Zool., Fac. Cienc., Lisbon, Portugal] The ongrowing of a batch of post metamorphosed larvae of Dover sole was carried out in an open seawater circuit, at 20.0-21.8°C and 29.4-30.4°/oo of salinity. The daily amount of food in the form of dry pellets was from 15 to 35% of the wet body weight of the fish. Both the formulation and the chemical composition are detailed in the text. The growth and survival were followed and calculations of the food conversion rate, the food conversion efficiency and of the specific growth rates were made. Results show a mode-rate growth rate, a relatively low survival, due mainly to disease problems, but quite good daily growth rates (ranging from 0.16 to 0.48 mm/day, 0.66 to 15.99 mg/day and 0.1 to 2.8%/day) and the specific growth rates ranging from 0.11 to 2.82.

83-001331 Bower, C. E. and D. T. Turner. NITRIFICATION IN CLOSED SEAWATER CULTURE SYSTEMS: EFFECTS OF NUTRIENT DEPRIVATION. *Aquaculture* 34(1-2):85-92. July 1983. SFA 28(3)
[Sea Res. Found., Inst. Aquarium Stud., 968 Capitol Ave., Hartford, CT 06106] Nitrifying bacteria in closed, conditioned seawater culture systems remained active for periods up to 16 weeks after nitrogen input to the system had been terminated by removing all the stocked fish. The amounts of ammonia that were oxidized in 24 h decreased by 8, 47, 54, 62, and 91% after 1, 2, 4, 8, and 16 weeks, respectively, of nutrient deprivation, as compared with values measured before the onset of deprivation. As expected, decreases in nitrite oxidation were nealy identical with those for ammonia. Pre-deprivation nitrification rates were recovered rapidly, upon the reintroduction of ammonia into the water; at least 70% of the initial ammonia-oxidizing capacities were regained within 48 h, even in systems that had been deprived of nutrients for 8 weeks.

MARICULTURE (CONTINUED)

83-001332 Freddi, A.; L. Berg and M. Bilio. OPTIMAL SALINITY-TEMPERATURE COMBINATIONS FOR THE EARLY LIFE STAGES OF GILTHEAD BREAM, *SPARUS AURATUS* L. *J. World Maricult. Soc.* 12(2):130-136. 1981. SFA 28(3)

[SIRAP, Via Murrazzi, I-30010 Pellestrina, Italy] High larval mortalities during rearing of gilthead bream, *Sparus auratus* L., led to experiments on the influence of salinity and temperature on eggs and yolk-sac larvae. Test salinities ranged from 5 to 70 ppt for eggs and from 15 to 45 ppt for larvae; experimental temperatures were 18-20°C for eggs and 18, 23, and 26°C for larvae. Spawning conditions were 18-20°C and 33-35 ppt salinity; the holk-sac larvae were chosen from hatches obtained under similar conditions (18°C and 35 ppt salinity). For eggs the optimum survival range was found to be 30-50 ppt at 18°C and 15-60 ppt at 23°C, while that for yolk-sac larvae was 15-25 ppt at all three temperatures. Choosing normal development (no dorsal curvature) as the decisive criterion, the optimum salinity range for egg incubation was reduced to 30-40 ppt at 18°C and to 35-45 ppt at 23°C, while that for the yolk-sac stage remained 15-25 ppt at all test temperatures. Egg incubation was most successful at salinity-temperature combinations close to those during spawning, whereas salinity had to be reduced by at least 10 ppt for yolk-sac larvae.

83-001333 Hoffmann, E. MARINE AQUACULTURE IN DENMARK. *J. World Maricult. Soc.* 12(2):3-8. 1981. SFA 28(3)

[Danish Inst. Fish. Mar. Res., Charlottenlund Castle, DK-2920 Charlottenlund, Denmark]

83-001334 Kuwa, M. [CORROSION AND PROTECTION OF FISH CULTURING FLOATING CAGE MADE OF WIRE NETTING.] *Bull. Jpn. Soc. Sci. Fish.* 49(2):165-175. Feb. 1983. In Japanese with English summ. SFA 28(3)

[Cath. Prot. Tech. Dep., Nakagawa Corrosion Protecting Co. Ltd., 2-2-2, Kajicho, Chiyoda, Tokyo 101, Japan]

83-001335 Nishimura, A. and M. Seki. [EFFECTS OF LIME FOR THE IMPROVEMENT OF MARICULTURE GROUNDS AKIFUMI NISHIMURA AND MASAO SEKI.] *Bull. Jpn. Soc. Sci. Fish.* 49(3):353-358. Mar. 1983. In Japanese with English summ. SFA 28(3)

[Mie-Hamajima Fish. Exp. Stn., Hamajima, Shima, Mie 517-04, Japan] Effects of liming for the improvement of mariculture grounds were studied in a model system. Lime (CaO) increased pH of the sea water and consequently sulfied and ammonium ion were eluted from the bottom mud. Lime transmuted gradually into magnesium hydroxide as a result of the exchange of Ca^{2+} for Mg^{2+}. Lime and magnesium hydroxide efficiently inhibited the growth of sulfate-reducing bacteria for a long term, and accordingly the formation of hydrogen sulfide was reduced. Amount of lime required to prevent the formation of hydrogen sulfide in mariculture grounds was estimated to be 100-200 g/m^2. These results suggest that lime is an effective material for the improvement of mariculture grounds.

83-001336 Person-Le Ruyet, J.; D. L'Elchat and G. Nedelec. RESEARCH ON REARING TURBOT (*SCOPHTHALMUS MAXIMUS*): RESULTS AND PERSPECTIVES. *J. World Maricult. Soc.* 12(2):143-152. 1981. SFA 28(3)

[Cent. Oceanol. Bretagne, B.P. 337, 29273 Brest Cédex, France] At the Centre Océanologique de Bretagne, a research program on turbot rearing has been in progress for several years. The life cycle is now under control. Up to 10,000 3-month-old juveniles can be produced per natural or shifted spawning season. Attention is now focused on the first week stages. Obtaining an average survival of 10% from hatching up to 3 months is still

MARICULTURE (CONTINUED)

83-001336 CONTINUED difficult. Weaning generally starts in 30 day-old larvae (75 mg wet weight) and the gross mortality during weaning is near 50%. Three-month-old juveniles weigh about 2 g. In Brittany, culture necessarily begins in a nursery using heated water. The grow-out period begins between 5 and 20 g: 5 g when winter is over, 20 g when winter is coming. At this stage they can grow either in tanks or in floating sea-cages and they may be fed dry pellets. After 20 g, moist foods containing at least 25%, on dry basis, of trashed fish are more efficient. Pure trashed fish also gives good results. The food conversion ratio is about 1 (dry food weight/wet weight fish gain). The first data on turbot growth in intensive conditions are encouraging. In our area, annual temperature of the open sea ranges from 7 to 18°C allowing an average weight gain of 1 kg at 2 years and 2 kg (3 kg in the best case) at 3 years of age. Control of spawning season is still necessary to obtain a good market size of about 2 kg of body weight in less than 3 years.

83-001337 Trimble, W. C.; W. M. Tatum and S. A. Styron. POND STUDIES ON GULF KILLIFISH (*FUNDULUS GRANDIS*) MARICULTURE. *J. World Maricult. Soc.* 12(2):50-60. 1981. SFA 28(3)

[Claude Peteet Maricult. Cent., Ala. Mar. Resour. Div., P.O. Drawer 548, Gulf Shores 36542] Investigations concerning spawning, hatching, and grow-out of gulf killifish (*Fundulus grandis*) were conducted in 0.08-ha, brackish-water ponds at Alabama's Claude Peteet Mariculture Center during 1979. Adult gulf killifish stocked at 88,750 fish/ha and a 1:1 sex ratio in 3 spawning ponds deposited 499,777 eggs on 1,001 Spanish moss mats placed around pond margins between 1 March and 13 August. Rate of egg deposition was highest in March (4,103 eggs/day/pond) and lowest in July and August (36 eggs/day/pond). A total of 293,467 eggs and 416 mats transferred to 3 hatching ponds between 13 March and 8 May produced 218,921 juvenile killifish (75% survival) averaging 0.5 g at harvest on 6 June. Production and feed conversion in hatching ponds averaged 413.90 kg/ha and 1.9, respectively. Stocked on 6 June in 4 grow-out ponds each at either 250,000 or 370,00 fish/ha and fed either 2 or 3 times daily, the juvenile gulf killifish reached marketable size (2.4 g and 57 mm total length) in 49 days. Production in grow-out ponds averaged 658 kg/ha with 93% survival and 2.4 feed conversion. Analysis (2 x 2 factorial) of grow-out data indicated no significant differences for effects of densities and feeding on mean weights of fish at harvest.

83-001338 Tseng, W. Y. and C. T. Poon. HYBRIDIZATION OF *EPINEPHELUS* SPECIES. *Aquaculture* 34(1-2):177-182. July 1983. SFA 28(3)

[Mar. Sci. Lab., Dep. Biol. Chinese Univ. Hong Kong, Shatin, N.T., Hong Kong] Hybridization was achieved between cultured female white-spotted green grouper (*Epinephelus amblycephalus*) and wild male red grouper (*E. akaara*). Human chorionic gonadotropin was used to induce maturation, and the eggs were fertilized by the dry method. Larval rearing to juveniles was achieved, feeding fertilized oyster eggs, rotifers, and brine shrimp nauplii.

83-001339 Williams, J. E.; P. A. Sandifer and J. M. Lindbergh. NET-PEN CULTURE OF STRIPED BASS X WHITE BASS HYBRIDS IN ESTUARINE WATERS OF SOUTH CAROLINA: A PILOT STUDY. *J. World. Maricult. Soc.* 12(2):98-110. 1981. SFA 28(3)

[Mar. Resour. Inst., S.C. Wildl. Mar. Resour. Dep., P.O. Box 12559, Charleston 29412] In 1978 a cooperative pilot study was initiated by the Marine Resources Research Institute and DØMSEA Farms, Inc. to examine the feasibility of rearing striped bass (*Morone saxatilis*) x white bass (*M. chrysops*) hybrids to marketable pan-size in estuarine net-pens. The

MARICULTURE (CONTINUED)

83-001339 CONTINUED first study was begun in July 1978 when a total of 1,070 hybrid fingerlings (mean weight, 1.7 g) were stocked in 3.05 x 2.44 x 1.83 m deep net-pens moored to a commercial marina dock on the Stono River near Charleston, S.C. During the first month these fish suffered a 76% mortality, apparently as a result of feeding only a dry salmon ration. Thereafter, the remaining fish were fed the dry ration mixed approximately half-and-half with ground fish. At the end of one year, these fish had attained a mean weight of 523.0 g, with 74.6% survival. A second experiment was begun in July 1979 when 900 hybrid fingerlings (mean weight, 3.0 g) were stocked in each of three 3.05 x 2.44 x 1.83 m net-pens at the marina (stocking density, ≅66 fish/m^3). The fish were fed a mixture of dry salmon feed and ground fish throughout. At the end of one year, survival and weight averaged 88% and 310.2 g, respectively. Biomass in the pens at this time averaged 16 kg/m^3. Little growth or active feeding occurred at temperatures <15°C. In contrast, salinity variations had no apparent effect on growth. However, a period of decreasing salinity in early spring coincided with an outbreak of a bacterial disease (cf. *Vibrio anguillarum*) among striped bass fingerlings reared in adjacent pens. Fish which had been treated with a vaccine solution did not succumb to the disease, while approximately 50% mortality occurred among non-vaccinated fingerlings.

FEEDS, FEEDING, AND NUTRITION

83-001340 Baldwin, W. J. THE DESIGN AND OPERATION OF AN AUTOMATIC FEED DISPENSER. *Aquaculture* 34(1-2):151-155. July 1983. SFA 28(3)

[Inst. Mar. Biol., Univ. Hawaii, P.O. Box 1346, Kaneohe 96744] An inexpensive, non-electric, compartmentalized, feed dispenser was developed for livebait for skipjack tuna and tested for 3 years. It operates on the same principle as a clypsydra water clock, does not require eletrical power, sophisticated components, or expensive materials, and is reasonably simple to construct and operate.

83-001341 Eckhardt, O.; K. Becker and K. Günther. ZUM PROTEIN-UND ENERGIEBEDARF WACHSENDER SPIEGELKARPFEN (*CYPRINUS CARPIO* L.). IV. ABLEITUNG DES BEDARFES AN VERFÜGBAREM PROTEIN UND AN UMSETZBARER ENERGIE, WENN HOHE WACHSTUMSRATEN REALISIERT WERDEN SOLLEN. [ON THE PROTEIN AND ENERGY REQUIREMENT OF GROWING CARPS (*CYPRINUS CARPIO* L.). IV. DERIVATION OF REQUIREMENT ON AVAILABLE PROTEIN AND METABOLIZABLE ENERGY, IF HIGH GROWTH RATES ARE TO BE REALIZED.] *J. Anim. Physiol. Anim. Nutr.* 49(4-5):260-265. May 1983. In German with English summ. SFA 28(3)

[Inst. Tierphysiol. Tierern., Oskar-Kellner-Weg 6, 3400 Göttengen-Weende, West Germany] From feeding tests with a large number of different rations requirement constants for optimum utilization at maximun charge of mass and protein were determined. The experiments extended over a period of 9 to 10 weeks, during which time the individual fish mass increased from 40 to over 300 grams. As guide number for the demand on available protein and metabolizable energy, ca. 3 gram available protein and 230 to 260 KJ metabolizable energy per $W^{0.8} \cdot d^{-1}$ could be calculated. From this results a protein-energy ratio of ca. 12 to 13 g available protein per MJ metabolizable energy has been calculated.

83-001342 Edwards, P.; C. Polprasert; C. Pacharaprakiti; V. S. Rajput and S. Suthirawut. COMPOST AS FISH FEED, A PRACTICAL APPLICATION OF DETRITIVORY FOR THE CULTIVATION OF TILAPIA. *Aquaculture* 32(3-4):409-413. May 1983.

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

83-001342 CONTINUED SFA 28(3)
[Asian Inst. Technol., P.O. Box 2754, Bangkok, Thailand] Compost produced from nightsoil and water hyacinth by the Chinese method of aerobic composting was added to a series of 200-m^2 earth fish ponds containing the tilapia *Oreochromis niloticus* (Linn.). The fish consumed compost directly and produced significant fish yields at a mean food conversion ratio of 7.4, only slightly higher than that of 4-6 reported for cereals, assuming comparable feed moisture contents. Compost may be a cheap supplementary feed suitable for tilapia cultivation in developing countries.

83-001343 Gatesoupe, F. NUTRITIONAL AND ANTIBACTERIAL TREATMENTS OF LIVE FOOD ORGANISMS: THE INFLUENCE ON SURVIVAL, GROWTH RATE AND WEANING SUCCESS OF TURBOT *(SCOPHTHALMUS MAXIMUS). Ann. Zootech. (Paris)* 31(4):353-368. 1982. SFA 28(3)
[I.N.R.A., Cent. Rech. Hydrobiol., Saint-Pée-sur-Nivelle, F 64310 Ascain, France]

83-001344 Gatesoupe, F. WEANING OF SOLE, *SOLEA SOLEA*, BEFORE METAMORPHOSIS, ACHIEVED WITH HIGH GROWTH AND SURVIVAL RATES. *Aquaculture* 32(3-4):401-404. May 1983. SFA 28(3)
[I.N.R.A., Cent. Rech. Hydrobiol., Lab. d'Elevage Nutr.-Poissons, Saint-Pée-sur-Nivelle, 64310 Ascain, France] Sole were weaned from live *Artemia* onto a compound diet between days 10 and 15 after hatching. By day 62, between 28 and 61 sole survived per 100 hatched larvae, and their mean weight at day 70 was between 189 and 414 mg. These results were comparable with those obtained by other authors who weaned sole between days 25 and 35, except for a mean weight of 1070 mg on day 70 obtained by Fuchs (1979). The interest of such an early weaning lies in its saving of live food. Approximately 3 X 10^3 nauplii were required per sole surviving at the end of these experiments, i.e. a saving of 90% compared with Fuchs' experiments.

83-001345 Gulbrandsen, K. E. and F. Utne. THE EFFECT OF FISH MEAL CONTAINING DIFFERENT LEVELS OF FISH SOLUBLES ON THE GROWTH OF RAINBOW TROUT *(SALMO GAIRDNERI). J. World Maricult. Soc.* 12(2):88-95. 1981. SFA 28(3)
[Norwegian Herring Oil and Meal Industry Res. Inst., N-5033 Fyllingsdalen, Norway]

83-001346 Harada, T.; O. Murata and T. Norita. [THE EFFECTS RESULTING FROM CERTAIN DIETS ON YOUNG BLUEFIN TUNA, *THUNNUS THYNNUS*.] *Mem. Fac. Agric. Kinki Univ.* No. 16. p. 59-65. Mar. 1983. In Japanese with English summ. SFA 28(3)
[Lab. Maricult., Dep. Fish., Kinki Univ., Higashiosaka, Osaka, 577 Japan]

83-001347 Hepher, B.; I. C. Liao; S. H. Cheng and C. S. Hsieh. FOOD UTILIZATION BY RED TILAPIA - EFFECTS OF DIET COMPOSITION, FEEDING LEVEL AND TEMPERATURE ON UTILIZATION EFFICIENCIES FOR MAINTANANCE AND GROWTH. *Aquaculture* 32(3-4):255-275. May 1983. SFA 28(3)
[Fish. Aquaculture. Res. Stn., D.N. Hof Hacarmel, 30820 Dor, Israel]

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

83-001348 Hilton, J. W. POTENTIAL OF FREEZE-DRIED WORM MEAL AS A REPLACEMENT FOR FISH MEAL IN TROUT DIET FORMULATIONS. *Aquaculture* 32(3-4):277-283. May 1983. SFA 28(3)

[Dep. Nutr., Univ. Guelph, Guelph, ON N1G 2W1, Canada] The potential of freeze-dried worm meal as a feedstuff and replacement for fish meal in trout diet formulations was determined. Worm meal is a high protein feedstuff low in a number of essential amino acids especially sulphur amino acids. Ash content was approximately 10%, with no high levels of minerals. There was a significant linear regression of ($P< 0.05$) of final body weight of rainbow trout on level of worm meal in the formulation. Protein digestibility was high (95%) and apparently not the cause of the growth depression of the trout reared on the worm meal diets. Feeding response of trout was noticeably reduced by comparison with trout reared on high fish meal diets, indicating a lack of some unidentified essential component in the high worm meal diets. Freeze-dried worm meal is not a satisfactory replacement for fish meal in trout formulations.

83-001349 Jobling, M. and A. Wandsvik. QUANTITATIVE PROTEIN REQUIREMENTS OF ARCTIC CHARRR, *SALVELINUS ALPINUS* (L). *J. Fish Biol.* 22(6):705-712. June 1983. SFA 28(3)

[Inst. Fiskerifag, Univ. Tromsø, 9001 Tromsø, Norway] Arctic charr, *Salvelinus alpinus*, require diets with protein energy (PE):total energy (TE) ratios of a least 0.35 in order to maintain good rates of growth. The protein requirement is, therefore, similar to that of rainbow trout, *Salmo gairdneri*. Protein retention efficiency (PPV) declined as the protein content of the diet was increased, the relationship being described by the equation: PPV=87.293-1.160(PE:TEX100). It is suggested that charr will maintain good rates of growth if fed on diets used for commercial culture of rainbow trout and special formulations for charr should not be necessary.

83-001350 Luquet, P.; J. P. Cravedi; G. Choubert; J. Tulliez and G. Bories. LONG-TERM INGESTION BY RAINBOW TROUT OF SATURATED HYDROCARBONS: EFFECTS OF *n*-PARAFFINS, PRISTANE AND DODECYLCYCLOHEXANE ON GROWTH, FEED INTAKE, LIPID DIGESTIBILITY AND CANTHAXANTHIN DEPOSITION. *Aquaculture* 34(1-2):15-25. July 1983. SFA 28(3)

[Lab. Nutr. Poissons, I.N.R.A., Cent. Rech. Hydrobiol., Saint-Pée sur Nivelle B.P. 3, 64310 Ascain, France]

83-001351 Mackie, A. M. and A. I. Mitchell. STUDIES ON THE CHEMICAL NATURE OF FEEDING STIMULANTS FOR THE JUVENILE EUROPEAN EEL, *ANGUILLA ANGUILLA* (L.). *J. Fish Biol.* 22(4):425-430. Apr. 1983. SFA 28(3)

[Inst. Mar. Biochem., Nat. Environ. Res. Council, Aberdeen AB1 3RA, Scotland] A study has been made of the chemical nature of feeding stimulants for juvenile European eels, *Anguilla anguilla*. Mixtures of *L*-amino acids were stimulatory, while neither the corresponding *D*-amino acids nor the non-amino acid components were effective. Synergistic effects were observed both between *L*-amino acids and between *L*-amino acids and non-amino acid constituents. The results are discussed in the context of results obtained from electrophysiological and behavioural studies with other species.

83-001352 Mazzola, A. and B. Rallo. FURTHER EXPERIENCES IN THE INTENSIVE CULTURE OF SEABREAM (*SPARUS AURATA* L.). *J. World Maricult. Soc.* 12(2):137-142. 1981. SFA 28(3)

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[Milwaukee Publ. Mus., 800 W. Wells St., Milwaukee, WI 53233] Six groups of goldfish, held on a 12L:12D photoperiod and 10°C, had access to food once daily at one of six different times of day. Appetite, somatic growth (weight and length), condition, and gonadal growth (females only) differed among the groups depending on the time-of-day of feeding.

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83-001358 Satoh, S.; H. Yamamoto; T. Takeuchi and T. Watanabe. [EFFECTS ON GROWTH AND MINERAL COMPOSITION OF RAINBOW TROUT OF DELETION OF TRACE ELEMENTS OR MAGNESIUM FROM FISH MEAL DIET.] *Bull. Jpn. Soc. Sci. Fish.* 49(3):425-429. Mar. 1983. In Japanese with English summ. SFA 28(3)
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83-001362 Viola, S. and Y. Arieli. NUTRITION STUDIES WITH TILAPIA (*SAROTHERODON*). 1. REPLACEMENT OF FISHMEAL BY SOYBEANMEAL IN FEEDS FOR INTENSIVE TILAPIA CULTURE. *Bamidgeh* 35(1):9-17. Mar. 1983. SFA 28(3)
[Miloubar Cent. Feedmill, D.N. Ashrat 25201, Israel] Pellets of 25% protein with fishmeal as the only protein supplement were compared with isonitrogeneous pellets containing 20% soybean meal as a partial replacement for fishmeal in cage trials. Growth rates, feed conversions and body compositions were very similar. The same pellets were tested at different feeding rates and densities in different seasons. Growth rates, feed conversions and body compositions were parallel in all the trials for both kinds of pellets. Apparently, soybeanmeal can be used to replace up to half of the fishmeal in tilapia feeds of 25% protein content without requiring any other supplements.

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TRANSPORTING FISH

83-001365 Mishra, B. K.; D. Kumar and R. Mishra. OBSERVATIONS ON THE USE OF CARBONIC ACID ANAESTHESIA IN FISH FRY TRANSPORT. *Aquaculture* 32(3-4):405-408. May 1983. SFA 28(3)
[CIFRI, P.O. Kausalyagang, Via Bhubanewar-2, Orissa 751 002, India] Observations are reported on the use of carbonic acid anaesthesia in fish fry transport. The results indicate that live fry of *Labeo rohita* (Ham.) could be kept safely (with 95% survival) in the transport medium under a dose of 500 ppm of carbonic acid for as long as 215 h. Controls survived for only <106h.

83-001366 Nikinmaa, M.; A. Soivio; T. Nakari and S. Lindgren. HAULING STRESS IN BROWN TROUT (*SALMO TRUTTA*): PHYSIOLOGICAL RESPONSES TO TRANSPORT IN FRESH WATER OR SALT WATER, AND RECOVERY IN NATURAL BRACKISH WATER. *Aquaculture* 34(1-2):93-99. July 1983. SFA 28(3)
[Dep. Zool., Univ. Helsinki, Arkadiankatu 7, SF-00100 Helsinki 10. Finland] Brown trout were transported in diluted NaCl (0.6%) or fresh water, and allowed to recover in natural brackish water (salinity 0.6%). Transport in fresh water caused an increase in blood haemoglobin concentration, and decreases in mean cellular haemoglobin concentration, plasma osmolality,

TRANSPORTING FISH (CONTINUED)

83-001366 CONTINUED hyperglycaemia, muscle fat and liver glycogen content. Although present, these changes were markedly smaller in the animals transported in NaCl solution. Recovery in brackish water abolished the differences between the two groups, and the physiological parameters reached a steady-state level within a week of recovery.

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT

83-001367 Jørgensen, L. A SIMPLE NIGHT-DAY LIGHT SIMULATOR. *Aquaculture* 34(1-2):145-149. July 1983. SFA 28(3)
[Trondhjem Biol. Stn., N-7000 Trondheim, Norway] A description of a simple night-day light simulator is presented. The apparatus provides an automatic and stepless adjustment of the light intensity, and could, with some adaptation, be used in operating both lightbulbs and fluroescent tubes. The equipment permits light simulation of any season, latitude or water depth. Some experiments have indicated that a stepless light simulation may have a positive effect on both yolksac consumption and feeding rates of fish larvae. Thus the described equipment might be useful in aquaculture.

83-001368 Manci, W. E.; J. A. Malison; T. B. Kayes and T. E. Kuczynski. HARVESTING PHOTOPOSITIVE JUVENILE FISH FROM A POND USING A LIFT NET AND LIGHT. *Aquaculture* 34(1-2):157-164. July 1983. SFA 28(3)
[Aquacult. Res. Lab., Univ. Wis., 6080 McKee Rd., Madison 53711] A system which combined a lift net with a floating light was designed and used to harvest young-of-the-year yellow perch (*Perca flavescens*) from a 0.08-ha pond during the photopositive phase of their lift history. Harvesting was done in late May and June, when fish hatched in early May were 8-50 mm total length (TL). Fish larger than 50 mm TL were not captured by this method. System performance was superior to conventional seining interms of catch/unit of effort. A number of stress-inducing factors were markedly reduced, compared with conventional harvesting techniques. Capture ratio (total catch per set/final total harvest-total harvest to date) was highest early in the season and declined as the season progressed.

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[Sch. Life Sci., Univ. Coll. Buckingham MK18 1EG, England] Rarely *Gasterosteus aculeatus* populations occur where many individuals have lost their protective dorsal spines, ventral spines, pelvic girdle and lateral bony plates. Reduction in predation pressure is currently viewed as the causative factor. On the Isle of North Uist (Outer Hebrides) 10 spine-deficient *G. aculeatus* populations, sympatric with various fish and bird predators are described. All of the spine-deficient morph sticklebacks are found in acidic oligotrophic peat moorland lakes and pools where Ca^{2+} is $\leq$ 2.5 mg/l. It is propsed that calcium deficiency may have been an important selective agency in the evolution of skeletal reduction in these unusual populations.

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Growth changes in the silver pomfret, *Pampus argenteus* (Euphrasen), are correlated with the changes in the trophic level and marine habitat. Remarkable morphological changes occur during the juvenile stage after leaving the larval surface abode for a permanent benthopelagic life. The significant modifications are the acquisition of a subterminal mouth, elaborate falcate median fins and long pectoral fins suitable for vertical movement as well as column feeding. The predorsal and preanal spines completely sink beneath the flesh in grown-up adults. The fish is a herbivore in the post-larval period and becomes predominantly a carnivore in the later life.

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[Bioresour. Cent., Desert Res. Inst., P.O. Box 60220, Reno, NV 89506] The relict dace, *Relictus solitarius*, represents the only genus and species of fish native to Ruby, Butte, Goshute, and Steptoe valleys in northeastern Nevada. In their natural habitats temperature ranges 0-25 C and salinity 175-1,158 mg/liter. The upper median thermal tolerance limit (96-hr TL50) of Butte Valley relict dace was 30.6 C when acclimated at 18-20 C. Relict dace tolerated total dissolved solids (TDS) of 11,043 mg/liter with no mortality during 96-hr exposures, but experienced 100 percent mortality in concentrations of 15,759 mg/liter with a mean resistance time of 23 hours. Tolerance of relict dace to 30 C was lowered as TDS was increased from 2,845 to 5,652 mg/liter. The Butte Valley fish were slightly more resistant to elevated salinities than the Goshute Valley sample, and conversely the Goshute Valley sample may be slightly more resistant to elevated temperature.

83-001533 Vlieg, P.; G. Habib and G. I. T. Clement. PROXIMATE COMPOSITION OF SKIPJACK TUNA *KATSUWONUS PELAMIS* FROM NEW ZEALAND AND NEW CALEDONIAN WATERS. *N.Z. J. Sci.* 26(2):243-250. 1983. SFA 28(3)
[Appl. Biochem. Div., Dep. Sci. Indus. Res., Private Bag, Palmerston North, New Zealand]

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[Inst. Physiol., Siberian Br., Acad. Med. Sci. USSR, Novosibirsk, USSR]

83-001535 Wächtler, K. THE REGIONAL DISTRIBUTION OF CHOLINERGIC COMPONENTS IN THE BRAIN OF THE RATFISH (*CHIMAERA MONSTROSA*). *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 74(2):481-484. 1983. SFA 28(3)
[Inst. Zool. Tierärztlichen Hochsch. Hannover, 3 Hannover, West Germany]

PHYSIOLOGY (CONTINUED)

83-001536 Watabe, S.; Y. Itoh and K. Hashimoto. ISOLATION AND CHARACTERIZATION OF ACTIN FROM MACKERED DARK MUSCLE. *Bull. Jpn. Soc. Sci. Fish.* 49(3):491-497. Mar. 1983. SFA 28(3)
[Lab. Mar. Biochem., Fac. Agric., Univ. Tokyo, Bunkyo, Tokyo 113, Japan]

83-001537 Watabe, S.; Y. Ochiai; S. Kanoh and K. Hashimoto. PROXIMATE AND PROTEIN COMPOSITIONS OF REQUIEM SHARK MUSCLE. *Bull. Jpn. Soc. Sci. Fish.* 49(2):265-268. Feb. 1983. SFA 28(3)
[Lab. Mar. Biochem., Fac. Agric., Univ. Tokyo, Bunkyo, Tokyo 113, Japan]

83-001538 Weber, R. E.; R. M. G. Wells and J. E. Rossetti. ALLOSTERIC INTERACTIONS GOVERNING OXYGEN EQUILIBRIA IN THE HAEMOGLOBIN SYSTEM OF THE SPINY DOGFISH, *SQUALUS ACANTHIAS*. *J. Exp. Biol.* 103:109-120. Mar. 1983. SFA 28(3)
[Inst. Biol., Odense Univ., Campusvej 55, DK-5230 Odense M, Denmark]

83-001539 Wells, R. M. G. and R. E. Weber. OXYGENATIONAL PROPERTIES AND PHOSPHORYLATED METABOLIC INTERMEDIATES IN BLOOD AND ERYTHROCYTES OF THE DOGFISH, *SQUALUS ACANTHIAS*. *J. Exp. Biol.* 103:95-108. Mar. 1983. SFA 28(3)
[Dep. Zool., Univ. Auckland, Auckland, New Zealand]

83-001540 Wrothington, A. D.; N. A. A. MacFarlane and K. W. Easton. THE INDUCED SPAWNING OF ROACH, *RUTILUS RUTILUS* (L.), WITH THE ANTIOESTROGENS CLOMIPHENE AND TAMOXIFEN. *J. Fish Biol.* 22(3):253-257. Mar. 1983. SFA 28(3)
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83-001541 Yamawaki, H. LACTATE DEHYDROGENASE ACTIVITY AND LACTATE/PYRUVATE RATIO IN MUSCLE OF THERMALLY ACCLIMATED GOLDFISH. *Comp. Biochem. Physiol. B Comp. Biochem.* 74(4):775-780. 1983. SFA 28(3)
[Dep. Biol., Fac. Sci., Osaka City Univ., Sugimoto 3-chome, Sumiyoshi-ku, Osaka 558, Japan]

83-001542 Young, G. and J. N. Ball. ULTRASTRUCTURAL CHANGES IN THE ADENOHYPOPHYSIS DURING THE OVARIAN CYCLE OF THE VIVIPAROUS TELEOST *POECILIA LATIPINNA*. II. THE THYROTROPHIC CELLS AND THE THYROID GLAND. *Gen. Comp. Endocrinol.* 51(1):24-38. July 1983. SFA 28(3)
[Dep. Zool., Univ. Calif., Berkeley 94720]

83-001543 Young, G.; L. W. Crim; H. Kagawa; A. Kambegawa and Y. Nagahama. PLASMA 17α,20β-DIHYDROXY-4-PREGNEN-3-ONE LEVELS DURING SEXUAL MATURATION OF AMAGO SALMON (*ONCORHYNCHUS RHODURUS*): CORRELATION WITH PLASMA GONADOTROPIN AND *IN VITRO* REPRODUCTION BY OVARIAN FOLLICLES. *Gen. Comp. Endocrinol.* 51(1):96-105. July 1983. SFA 28(3)
[Lab. Reprod. Biol., Natl. Inst. Basic. Biol., Okazaki 444, Japan]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION

83-001544 Ståhl, G. DIFFERENCES IN THE AMOUNT AND DISTRIBUTION OF GENETIC VARIATION BETWEEN NATURAL POPULATIONS AND HATCHERY STOCKS OF ATLANTIC SALMON. *Aquaculture* 33(1-4):23-32. June 1983. SFA 28(3)
[Dep. Genet., Univ. Stockholm, S-106 91 Stockholm, Sweden] Tissue samples from a total of 1643 Atlantic salmon collected from naturally reproducing populations and hatchery stocks representing nine major river systems draining into the Baltic Sea were electrophoretically analyzed for 37 enzyme loci. Pronounced spatial genetic heterogeneity was generally observed among samples within as well as between different river systems. Samples representing hatchery stocks exhibit a significantly lower amount of genetic variability than natural populations. This is displayed as both a reduced variation within hatchery stocks and a lower amount of genetic divergence between them.

83-001545 Allen, S. K., Jr. FLOW CYTOMETRY: ASSAYING EXPERIMENTAL POLYPLOID FISH AND SHELLFISH. *Aquaculture* 33(1-4):317-328. June 1983. SFA 28(3)
[Sch. Fish., WH-10, Univ. Wash., Seattle 98195]

83-001546 Allen, S. K., Jr. and J. G. Stanley. PLOIDY OF HYBRID GRASS CARP X BIGHEAD CARP DETERMINED BY FLOW CYTOMETRY. *Trans. Am. Fish. Soc.* 112(3):431-435. May 1983. SFA 28(3)
[Me. Coop. Fish. Res. Unit, Univ. Me., Orono 04469]

83-001547 Angus, R. A. and R. J. Schultz. MERISTIC VARIATION IN HOMOZYGOUS AND HETEROZYGOUS FISH. *Copeia* 1983(2):287-299. 6 May 1983. SFA 28(3)
[Biol. Dep., Univ. Ala., Birmingham 35294]

83-001548 Ayles, G. B. and R. F. Baker. GENETIC DIFFERENCES IN GROWTH AND SURVIVAL BETWEEN STRAINS AND HYBRIDS OF RAINBOW TROUT (*SALMO GAIRDNERI*) STOCKED IN AQUACULTURE LAKES IN THE CANADIAN PRAIRIES. *Aquaculture* 33(1-4):269-280. June 1983. SFA 28(3)
[Freshwater Inst., 501 University Crescent, Winnipeg, MB R3T 2N6, Canada] Several thousand small, shallow, highly productive lakes across the Canadian prairies are used by farmers for commercial and recreational production of rainbow trout. This report summarizes the results of evaluations of genetic differences between strains of trout from 1972 to 1978. Strains of fish were obtained from the wild and from private and government hatcheries in Canada, the U.S.A., and Europe. Matched plantings of different strains were made in several experimental lakes annually and growth and survival were determined. The relative effects of strains (genetic effect), lakes (environment effects) and strain X lake interactions were determined in each study. Significant hybrid vigour for both growth and survival was observed for some but not all crosses.

83-001549 Beck, M. L. and C. J. Biggers. ERYTHROCYTE MEASUREMENTS OF DIPLOID AND TRIPLOID *CTENOPHARYNGODON IDELLA* X *HYPOPHTHALMICHTHYS NOBILIS* HYBRIDS. *J. Fish Biol.* 22(4):497-502. Apr. 1983. SFA 28(3)
[Dep. Biol., Memphis State Univ., Memphis, TN 38152]

83-001550 Beck, M. L.; C. J. Biggers and H. K. Dupree. ELECTROPHORETIC ANALYSIS OF PROTEIN SYSTEMS OF *CTENOPHARYNGODON IDELLA* (VAL.), *HYPOPHTHALMICHTHYS NOBILIS* (RICH.) AND THEIR F_1 TRIPLOID HYBRID.

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

83-001550 CONTINUED *J. Fish Biol.* 22(5):603-611. May 1983. SFA 28(3)
[Dep. Biol., Memphis State Univ., Memphis, TN 38152]

83-001551 Blaxhall, P. C. CHROMOSOME KARYOTYPING OF FISH USING CONVENTIONAL AND G-BANDING METHODS. *J. Fish Biol.* 22(4):417-424. Apr. 1983. SFA 28(3)
[Dep. Life Sci., Trent Polytech., Nottingham, England]

83-001552 Brett, B. L. H. and B. J. Turner. GENETIC DIVERGENCE IN THE *POECILIA SPHENOPS* COMPLEX IN MIDDLE AMERICA. *Biochem. Syst. Ecol.* 11(2):127-137. 1983. SFA 28(3)
[Univ. Rochester, Rochester, NY 14627]

83-001553 Busack, C. A. FOUR GENERATIONS OF SELECTION FOR HIGH 56-DAY WEIGHT IN THE MOSQUITOFISH *(GAMBUSIA AFFINIS). Aquaculture* 33(1-4):83-87. June 1983. SFA 28(3)
[Agric. Prog., Dep. Anim. Sci., Univ. Calif., Davis 95616] Two lines of mosquitofish were subjected to within-family selection for high 56-day weight for four generations. Comparison with the control line indicated a selection respone in both sexes but only the male response was statistically significant. Relative to expected gains, males responded more strongly than females. A strong response was also observed in the proportion of males mature at 56 days of age. The performance of all lines in maturity and weight declined substantially during the study. What caused the decline is uncertain. The pattern of decline over time was not entirely consistent with an environmental cause, but there was also no direct evidence for a genetic cause. Unintentional selection, possibly involving intergenotype competition, is the most likely genetic cause of the decline.

83-001554 Chevassus, B. HYBRIDIZATION IN FISH. *Aquaculture* 33(1-4):245-262. June 1983. SFA 28(3)
[Lab. Fish Physiol., I.N.R.A., 78350 Jouy-en-Josas, France]

83-001555 Cross, T. F. and J. King. GENETIC EFFECTS OF HATCHERY REARING IN ATLANTIC SALMON. *Aquaculture* 33(1-4):33-40. June 1983. SFA 28(3)
[Salmon Res. Trust Ireland, Farran Lab., Newport, Cty. Mayo, Ireland] Six polymorphic enzyme loci were examined electrophoretically in a sample of wild Atlantic salmon smolts from the Burrishoole river in western Ireland and in samples of artificially-reared fry hatched in 1981 and parr hatched in 1979. These hatchery reared fish were the progeny of five generations of artificially reared sea ranched salmon which had originally come from the Burrishoole river. Selection for growth and disease resistance was practiced and between ten and 30 females and similar numbers of males were used as parents in each generation. Gene frequencies differed significantly at a number of loci between the wild and the artificially reared samples. Erosion of genetic variability, as measured by mean heterozygosity and mean number of alleles over the six loci, was evident in both hatchery reared smaples. It is argued that the observed genetic changes are caused by founder effects and genetic drift rather than selection by some aspects of the artificial rearing regime. The importance of using adequate numbers of parents in hatchery rearing is stressed, since it is shown that differences between wild and reared populations are as great as between natural populations from Irish rivers.

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

83-001556 Duggins, C. F., Jr.; A. A. Karlin and K. G. Relyea. ELECTROPHORETIC VARIATION IN THE KILLIFISH GENUS *LUCANIA*. *Copeia* 1983(2):564-570. 6 May 1983. SFA 28(3)
[Biol. Dep., Cameron Univ., Lawton, OK 73505]

83-001557 Ferguson, M. M. and D. L. G. Noakes. BEHAVIOUR-GENETICS OF LAKE CHARR (*SALVELINUS NAMAYCUSH*) AND BROOK CHARR (*S. FONTINALIS*): OBSERVATION OF BACKCROSS AND F_2 GENERATIONS. *J. Comp. Ethol.* 62(1):72-86. May 1983. SFA 28(3)
[Dep. Zool., Univ. Guelph, Guelph, ON, Canada]

83-001558 Gall, G. A. E. GENETICS OF FISH: A SUMMARY OF DISCUSSION. *Aquaculture* 33(1-4):383-394. June 1983. SFA 28(3)
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83-001559 Gjedrem, T. GENETIC VARIATION IN QUANTITATIVE TRAITS AND SELECTIVE BREEDING IN FISH AND SHELLFISH. *Aquaculture* 33(1-4):51-72. June 1983. SFA 28(3)
[Dep. Anim. Genet. Breeding, Agric. Univ. Norway, 1432 Ås-NLH, Norway]

83-001560 Hulata, G.; G. Wohlfarth and S. Rothbard. PROGENY-TESTING SELECTION OF TILAPIA BROODSTOCKS PRODUCING ALL-MALE HYBRID PROGENIES--PRELIMINARY RESULTS. *Aquaculture* 33(1-4):263-268. June 1983. SFA 28(3)
[Inst. Anim. Sci., Fish. Aquacult. Res. Stn., Dor, D.N. Hof Hacarmel 30820, Israel]

83-001561 Kang, L.; L. Yucheng and Z. Dun. [A COMPARATIVE STUDY OF THE KARYOTYPES IN TWO SPECIES OF MUD LOACHES.] *Zool. Res.* 4(1):81. 1983. SFA 28(3)
[Dep. Biol., Wuham Univ., China]

83-001562 McGregor, A. J. A BIOCHEMICAL GENETIC ANALYSIS OF PINK SALMON (*ONCORHYNCHUS GORBUSCHA*) FROM SELECTED STREAMS IN NORTHERN SOUTHEAST ALASKA. *Alaksa Dep. Fish Game Inf. Leafl.* No. 213. v + 70p. Mar. 1983. SFA 28(3)
[Alaska Dep. Fish Game, Div. Commer. Fish., Anchorage] This study was undertaken to determine the genetic structure of pink salmon, *Oncorhynchus gorbuscha*, stocks near the city of Juneau, in northern Southeast Alaska. It was accepted by the University of Alaska, Juneau in partial fulfillment of the requirements for the author's Master of Science degree in December 1982. Pink salmon were collected in 1978 and 1979 from twelve streams located within 64 km (40 mi) of Juneau. Intertidal and upstream areas of many streams were sampled on several different dates to allow both within stream (different spawning locations and times) and among stream comparisons to be made. Pink salmon from four streams in southern Southeast Alaska were compared with four systems in the Bering Sea region of Alaska. Tissue samples were electrophoretically analyzed at 25 loci. Analysis of breeding studies verified the genetic basis of the observed electrophoretic variation. A high level of genetic variation was shown to exist in Alaskan pink salmon. Eighteen loci were polymorphic, with a variant allele frequency greater than 0.01, in at least one collection. No significant allele frequency differences appeared among different segments of runs returing to selected streams.

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83-001562 CONTINUED Intertidal and upstream spawners, as well as early and late-run spawners, appeared to form a single spawning group in each stream. Heterogeneity among streams in the Juneau area was significant for the even-year class, but actually represented only a minor portion of the total genetic variation present. Genetic differences among regions were greater than within regions, and reflected the geographic distance between regions. The greatest differences in allele frequencies occurred between year classes.

83-001563 Meyer, M. K. XIPHOPHORUS-HYBRIDEN AUS NORD-MEXIKO, MIT EINER REVISION DER TAXA *X. KOSSZANDERI* UND *X. ROSENI*. [XIPHOPHORUS HYBRIDS FROM NORTH MEXICO, WITH A REVISION OF THE TAXA *X. KOSSZANDERI* AND *X. ROSENI*.] *Zool. Abh. (Dres.)* 38(18):285-291. 30 Mar. 1983. In German with English summ. SFA 28(3)
[Schwalheimer Hauptstr. 22, D-6350 Bod Nauheim 6, West Germany]

83-001564 Mork, J. and T. Haug. GENETIC VARIATION IN HALIBUT *HIPPOGLOSSUS HIPPOGLOSSUS* (L.) FROM NORWEGIAN WATERS. *Hereditas* 98(2):167-174. 1983. SFA 28(3)
[Biol. Stn., Trondheim, Norway]

83-001565 Naevdal, G. GENETIC FACTORS IN CONNECTION WITH AGE AT MATURATION. *Aquaculture* 33(1-4):97-106. June 1983. SFA 28(3)
[Inst. Mar. Res., N-5000 Bergen, Norway]

83-001566 Okazaki, T. GENETIC STRUCTURE OF CHUM SALMON *ONCORHYNCHUS KETA* RIVER POPULATIONS. *Bull. Jpn. Soc. Sci. Fish.* 49(2):189-196. Feb. 1983. SFA 28(3)
[Far Seas Fish. Res. Lab., Orido, Shimizu 424, Japan]

83-001567 Purdom, C. E. GENETIC ENGINEERING BY THE MANIPULATION OF CHROMOSOMES. *Aquaculture* 33(1-4):287-300. June 1983. SFA 28(3)
[Fish. Lab., Lowestoft, Suffolk NR33 0HT, England]

83-001568 Refstie, T. HYBRIDS BETWEEN SALMONID SPECIES. GROWTH RATE AND SURVIVAL IN SEAWATER. *Aquaculture* 33(1-4):281-285. June 1983. SFA 28(3)
[Dep. Anim. Genet. Breeding, Agric. Univ. Norway, 1432 Ås-NLH, Norway] Hybrids between four salmonid species were reared in seawater under fish farming conditions, together with control groups of their parental species. Survival rates, relative growth rates and weight at slaughtering were investigated. Growth and survival of the hybrids did not exceed that of Atlantic salmon (*Salmo salar*). It is concluded that hybrids between salmonid species have no advantages in fish farming in seawater, when compared with Atlantic salmon.

83-001569 Richardson, B. J. DISTRIBUTION OF PROTEIN VARIATION IN SKIPJACK TUNA (*KATSUWONUS PELAMIS*) FROM THE CENTRAL AND SOUTH-WESTERN PACIFIC. *Aust. J. Mar. Freshwater Res.* 34(2):231-251. 1983. SFA 28(3)
[Bur. Flora Fauna, Dep. Home Off. Environ., P.O. Box 1252, Canberra City, A.C.T. 2601, Australia] Forty-two loci were electrophoretically surveyed for protein variation in the skipjack tuna. A new polymorphism in guanine deaminase was found as well as low-frequency variation in glucosephosphate isomerase and adenosine deaminase. Average heterozygosity for the species was 0.032. The gene frequencies at four variable loci for 70 sample sets, each of

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83-001569 CONTINUED approximately 100 animals, collected at locations throughout the South Pacific Commission region, are given. East-west clines in allele frequencies for carboxylesterase and guanine deaminase occur across the study area. There is also within-area heterogeneity in allele frequency at these loci. Previously proposed discrete-stock models and a new isolation-by-distance model for the population structure of skipjack tuna are examined in the light of the genetic data.

83-001570 Ryman, N. PATTERNS OF DISTRIBUTION OF BIOCHEMICAL GENETIC VARIATION IN SALMONIDS: DIFFERENCES BETWEEN SPECIES. *Aquaculture* 33(1-4):1-21. June 1983. SFA 28(3)
[Dep. Genet., Univ. Stockholm, S-106 91 Stockholm, Sweden]

83-001571 Sakaizumi, M.; K. Moriwaki and N. Egami. ALLOZYMIC VARIATION AND REGIONAL DIFFERENTIATION IN WILD POPULATIONS OF THE FISH *ORYZIAS LATIPES*. *Copeia* 1983(2):311-318. 6 May 1983. SFA 28(3)
[Natl. Inst. Genet., Mishima 411, Japan]

83-001572 Takai, A. and Y. Ojima. THE ASSIGNMENT OF THE NUCLEOLUS ORGANIZER REGIONS IN THE CHROMOSOMES OF THE CARP, THE FUNA AND THEIR HYBRIDS (CYPRINIDAE, PISCES). *Proc. Jpn. Acad. Ser. B Physiol. Biol. Sci.* 58(10):303-306. Dec. 1982. SFA 28(3)
[Dep. Biol., Fac. Sci., Kwansei Gakuin Univ., Nishinomiya 662, Japan]

83-001573 Thompson, D. THE EFFICIENCY OF INDUCED DIPLOID GYNOGENESIS IN INBREEDING. *Aquaculture* 33(1-4):237-244. June 1983. SFA 28(3)
[Fish. Lab., Lowestoft, Suffolk NR33 0HT, England]

83-001574 Thorpe, J. E.; R. I. G. Morgan; C. Talbot and M. S. Miles. INHERITANCE OF DEVELOPMENTAL RATES IN ATLANTIC SALMON, *SALMO SALAR* L. *Aquaculture* 33(1-4):119-128. June 1983. SFA 28(3)
[Freshwater Fish. Lab., Pitlochry, Perthshire, Scotland] Alm (1959) demonstrated that rapid sexual maturation in salmonids accompanied rapid growth. In experiments at Almondbank, the inference that maturation and growth rates were aspects of a common developmental tempo was tested by comparing rates of growth, smolting and sexual maturation among 12 batches of progeny of three female Atlantic salmon and four males of differing age at first maturity. The present paper demonstrates that the incidence of maturation of males at age 1+, as parr, was significantly higher ($P<0.01$) among progeny of male parr than among progeny of males of total age 2+ and 2+ years (1.1+ and 2.1+). Further, the incidence of maturity as parr was increased 5.4 times (1.4-14.7 times) and further 1.7 times (1.6-1.7) over two and three generations respectively, in selection experiments using mature parr as sires. It is suggested that selection for rapid growth and late maturation in Atlantic salmon may be incompatible objectives, but that these objectives may be achieved best by a combination of selection for rapid development combined with environmental suppression of maturation.

83-001575 Uyeno, T.; R. R. Miller and J. M. Fitzsimons. KARYOLOGY OF THE CYPRINODONTOID FISHES OF THE MEXICAN FAMILY GOODEIDAE. *Copeia* 1983(2):497-510. 6 May 1983. SFA 28(3)
[Natl. Sci. Mus., Hyakunin-cho, Shinjuku, Tokyo, Japan]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

83-001576 Vasil'ev, V. P. and E. D. Vasil'eva. A NEW DIPLOID-POLYPLOID COMPLEX IN FISH. *Dokl. Biol. Sci. (Engl. Transl. Dokl. Akad. Nauk SSSR Ser. Biol.)* 226(1-6):518-521. Sept.-Oct. 1982. SFA 28(3)
[Inst. Evol. Morphol. Ecol. Anim., Acad. Sci. USSR, Moscow, USSR]

83-001577 Wagner, G. F. and B. A. McKeown. THE IMMUNOCYTOCHEMICAL LOCALIZATION OF PITUITARY SOMATOTROPS IN THE GENUS *ONCORHYNCHUS* USING AN ANTISERUM TO GROWTH HORMONE OF CHUM SALMON *(ONCORHYNCHUS KETA). Cell Tissue Res.* 231(3):693-697. June 1983. SFA 28(3)
[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada]

83-001578 Yamazaki, F. SEX CONTROL AND MANIPULATION IN FISH. *Aquaculture* 33(1-4):329-354. June 1983. SFA 28(3)
[Lab. Embryol. Genet., Fac. Fish., Hokkaido Univ., Hokadate, Japan]

83-001579 Yoshiyama, R. M. and C. Sassaman. MORPHOLOGICAL AND ALLOZYMIC VARIATION IN THE STICHAEID FISH *ANOPLARCHUS PURPURESCENS. Syst. Zool.* 32(1):52-71. Mar. 1983. SFA 28(3)
[Prog. Ecol., Univ. Tenn., Knoxville 37916]

83-001580 Zelinsky, Y. P.; A. V. Polina and I. M. Medvedeva. [THE KARYOTYPE AND FORMATION OF ADAPTATIONS IN A FRESHWATER LAKE CHAR OF THE GENUS *SALVELINUS* (SALMONIFORMES, SALMONIDAE) IN LAKE LADOGA.] *Zool. Zh.* 62(5):732-736. May 1983. In Russian with English summ. SFA 28(3)
[Inst. Biol., Karel Div. USSR Acad. Sci., Petrozavodsk, USSR]

BEHAVIOR

83-001581 Barlow, G. W. and K. R. McKaye. A COMPARISON OF FEEDING SPACING, AND AGGRESSION IN COLOR MORPHS OF THE MIDAS CICHLID, II. AFTER 2 HOURS WITHOUT FOOD. *Behaviour* 80(3-4):127-142. 1982. SFA 28(3)
[Dep. Zool., Univ. Calif., Berkeley 94720]

83-001582 Bless, R. UNTERSUCHUNGEN ZUR SUBSTRATPRÄFERENZ DER GROPPE *COTTUS GOBIO* LINNAEUS 1758 (PISCES: COTTIDAE). [STUDY OF SUBSTRAT PREFERENCE OF SCULPINS, *COTTUS GOBIO* LINNAEUS 1758 (PISCES: COTTIDAE). *Senckenbergiana Biol.* 63(3-4):161-165. 1982. In German with English summ SFA 28(3)
[Inst. Naturschutz Tierökol., Konstantinstr. 110, D-5300 Bonn 2, Wes Germany] Substrate preferences of different age-classes of *Cottus gobi* Linnaeus 1758 are compared. Individuals between 2.5-3.0 cm total lengt preferred particle sizes of 2-3 cm diameter. Fishes of about 6 cm tota length are related to gravel of 6-8 cm diameter. Sculpins of 10 cm tota length preferred stones of 15 cm diameter. The existence of this specie depends on a close relation of diverse substrate types.

83-001583 Bulkowski, L. and J. W. Meade. CHANGES IN PHOTOTAXIS DURIN EARLY DEVELOPMENT OF WALLEYE. *Trans. Am. Fish. Soc.* 112(3):445-447. Ma 1983. SFA 28(3)
[U.S. FWS, RD 4, Box 63, Wellsboro, PA 16901]

BEHAVIOR (CONTINUED)

83-001584 Carlstead, K. INFLUENCES OF MOTIVATION ON DISPLAY DIVERGENCES IN THREE CICHLID FISH SPECIES (*HAPLOCHROMIS*). *Behaviour* 83(3-4):205-228. 1983. SFA 28(3)
[Zool. Lab., Univ. Groningen, Haren (Gr.), Netherlands]

83-001585 Carlstead, K. THE BEHAVIORAL ORGANIZATION OF RESPONSES TO TERRITORIAL INTRUDERS AND FRIGHTENING STIMULI IN CICHLID FISH (*HAPLOCHROMIS* SPP.). *Behaviour* 83(1-2):18-68. 1983. SFA 28(3)
[Zool. Lab., Univ. Groningen, Haren (Gr.), Netherlands]

83-001586 Coon, T. G. COEXISTENCE IN A GUILD OF BENTHIC STREAM FISHES: THE EFFECTS OF DISTURBANCE. *Ph.D. dissertation, Univ. Calif. (Davis)* 205p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(10):3119. Apr. 1983. SFA 28(3)

83-001587 Dill, L. M. ADAPTIVE FLEXIBILITY IN THE FORAGING BEHAVIOR OF FISHES. *Can. J. Fish. Aquatic Sci.* 40(4):398-408. Apr. 1983. In English with French summ. SFA 28(3)
[Simon Fraser Univ., Dep. Biol. Sci., Burnaby, BC V5A 1S6, Canada]

83-001588 Feuth-de Bruijn, E. and P. Sevenster. PARENTAL REACTIONS TO YOUNG IN STICKLEBACKS (*GASTEROSTEUS ACULEATUS* L.). *Behaviour* 83(1-2):186-203. 1983. SFA 28(3)
[Div. Ethol., Dep. Zool., Univ. Leiden, Netherlands]

83-001589 Graf, W. and D. L. Meyer. CENTRAL MECHANISMS COUNTERACT VISUALLY INDUCED TONUS ASYMMETRIES. A STUDY OF OCULAR RESPONSES TO UNILATERAL ILLUMINATION IN GOLDFISH. *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 150(4):473-481. Apr. 1983. SFA 28(3)
[Rockefeller Univ., 1230 York Ave., New York, NY 10021]

83-001590 Helfman, G. S. RESIN-COATED FISHES: A SIMPLE MODEL TECHNIQUE FOR IN SITU STUDIES OF FISH BEHAVIOR. *Copeia* 1983(2):547-549. 6 May 1983. SFA 28(3)
[Dep. Zool., Univ. Ga., Athens 30602]

83-001591 Kellogg, R. L. and J. J. Gift. RELATIONSHIP BETWEEN OPTIMUM TEMPERATURES FOR GROWTH AND PREFERRED TEMPERATURES FOR THE YOUNG OF FOUR FISH SPECIES. *Trans. Am. Fish. Soc.* 112(3):424-430. May 1983. SFA 28(3)
[Dep. Stat., N.C. State Univ., Box 5457, Raleigh 27650]

83-001592 Levin, A. V. SUBSTRATE SELECTION, DAILY RHYTHM OF VERTICAL DISTRIBUTION AND SWIMMING SPEED OF JUVENILE RUSSIAN STURGEON, *ACIPENSER GUELDENSTAEDTI*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(4):130-136. 1982. SFA 28(3)
[TSNIORKH, Astrakhan, USSR] Juvenile sturgeon, *Acipenser gueldenstaedti*, displays different relationships to substrates of the northern Caspian Sea: compact substrates with fine structure are preferred and large fractions (large shells) are avoided. During the day-night period, irrespective of the nature of bottom cover, the vertical distribution and movements of young change rhythmically. With the onset of night, there is a pronounced movement toward the surface, and the swimming speed also increases simultaneously. A significant inverse correlation exists between light and swimming speed.

BEHAVIOR (CONTINUED)

83-001593 Losey, G. S., Jr. ECOLOGICAL CUES AND EXPERIENCE MODIFY INTERSPECIFIC AGGRESSION BY THE DAMSELFISH, *STEGASTES FASCIOLATUS*. *Behaviour* 81(1):14-37. 1982. SFA 28(3)
[Dep. Zool., Univ. Hawaii, Kaneohe]

83-001594 Luling, K. H. DER MILCHSEE (LACUL SIUTGHIOL) AN DER RUMÄNISCHEN SCHWARZMEERKÜSTE BEI MAMAIA ALS BIOTOP EINER SÜßWASSERPOPULATION DER SEENADEL (*SYNGNATHUS NIGROLINEATUS*) (PISCES, SYNGNATHIDAE). [THE LAKE SIUTGHIOL ON THE ROMANIAN BLACK SEA COAST NEAR MAMAIA AS THE BIOTOPE OF A FRESHWATER POPULATION OF THE PIPE-FISH (*SYNGNATHUS NIGROLINEATUS*) (PISCES, SYNGNATHIDAE).] *Zool. Anz.* 210(3-4):155-174. 1983. In German with English summ. SFA 28(3)
[Zool. Forschungsinst., Mus. Alexander Koenig, Bonn, West Germany]

83-001595 McNeely, D. L. NICHE RELATIONSHIPS OF THE CYPRINID FISHES OF SPRING CREEK, A TRIBUTARY OF THE NEOSHO RIVER, OKLAHOMA. *Ph.D. dissertation, Okla. State Univ.* 121p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(10):3122. Apr. 1983. SFA 28(3)

83-001596 Meyer, J. L.; E. T. Schultz and G. S. Helfman. FISH SCHOOLS: AN ASSET TO CORALS. *Science* 220(4601):1047-1049. 3 June 1983. SFA 28(3)
[Zool. Dep., Univ. Ga., Athens 30602] Schools of juvenile haemulid fish feed in sea grass beds at night. By day they rest over coral heads, where they excrete substantial quantities of ammonium and particulate nitrogen and phosphorus into the nutrient-poor waters. The percentages of these nutrients contributed by the fish were comparable to those from other sources. Coral heads with resident fish schools grew faster than those without resident schools, indicating that fish may be more beneficial to the corals than has been assumed.

83-001597 Mochek, A. D. and E. Val'Des-Mun'Oz. EFFECT OF THE BOTTOM RELIEF ON THE GROUP BEHAVIOR OF FISHES. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(6):151-153. 1982. SFA 28(3)
[IEMEZH, Moscow, USSR]

83-001598 Nikolaev, A. S. MIGRATION OF ADULT PINK SALMON, *ONCORHYNCHUS GORBUSCHA* (SALMONIDAE), IN DOBROE NACHALO BAY (ITURUP ISLAND). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(5):143-152. 1982. SFA 28(3)
[KoTINRO, Petropavlovsk-Kamchatskiy, USSR]

83-001599 Quinn, T. P.; E. L. Brannon and R. P. Whitman. PHEROMONES AND THE WATER SOURCE PREFERENCES OF ADULT COHO SALMON *ONCORHYNCHUS KISUTCH* WALBAUM. *J. Fish Biol.* 22(6):677-684. June 1983. SFA 28(3)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] It has been proposed that population-specific pheromones released by juvenile salmonids guide the adults on their homing migration (Nordeng, 1977). To evaluate this hypothesis, adult coho salmon, *Oncorhynchus kisutch*, were tested in a two-choice apparatus with a variety of water sources. Coho salmon preferred home water without coho odours over an unfamiliar water source (city water). Adults preferred water conditioned by juveniles of their own population over plain city water, but did not prefer water conditioned by juveniles of their own population over that of another.

BEHAVIOR (CONTINUED)

83-001600 Rowland, W. J. THE EFFECTS OF MALE NUPTIAL COLORATION ON STICKLEBACK AGGRESSION: A REEXAMINATION. *Behaviour* 80(1-2):118-126. 1982. SFA 28(3)
[Dep. Biol., Indiana Univ., Bloomington]

83-001601 Rowland, W. J. INTERSPECIFIC AGGRESSION IN STICKLEBACKS: *GASTEROSTEUS ACULEATUS* DISPLACES *APELTES QUADRACUS*. *Copeia* 1983(2):541-544. 6 May 1983. SFA 28(3)
[Dep. Biol., Indiana Univ., Bloomington 47405]

83-001602 Sbikin, Y. N. and N. N. Lapina. LOCOMOTORY AND FEEDING ACTIVITY OF JUVENILE SEVRUGA, *ACIPENSER STELLATUS* (ACIPENSERIDAE), WITH INCREASING SALINITY. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(5):138-142. 1982. SFA 28(3)
[IEMEZH, Moscow, USSR] The article deals with survival and changes in behavior of juvenile sevruga at the age of 35-45 days and lengths of 90 to 140 mm when transfered from fresh water to marine water of different salinities, without prior adaptation. Although some changes in the feeding and locomotory activities are observed in juvenile sevruga with sudden increase in salinity, not exceeding 10°/oo, in 2-3 days its behavior is completely normalized and does not differ from that in fresh water. Mortality did not occur under these conditions. When juvenile sevruga are transferred from fresh water to water of 15°/oo salinity, an unusual locomotory activity, fast movement with long stops and reduction in feeding activity, was observed for one week. Only 30% of the experimental fishes survived to the end of this period. When they were placed in water of 20°/oo salinity, their mortality after 6 h was 100%.

83-001603 Shirvell, C. S. and R. G. Dungey. MICROHABITATS CHOSEN BY BROWN TROUT FOR FEEDING AND SPAWNING IN RIVERS. *Trans. Am. Fish. Soc.* 112(3):355-367. May 1983. SFA 28(3)
[Dep. Fish. Oceans, Room B6, 417 2nd Ave. West, Prince Rupert, BC V8J 1G8, Canada]

83-001604 Shrode, J. B.; L. J. Purcell and J. S. Stephens, Jr. ONTOGENY OF THERMAL PREFERENCE IN FOUR SPECIES OF VIVIPAROUS FISHES (EMBIOTOCIDAE). *Environ. Biol. Fishes* 9(1):71-76. 1 May 1983. SFA 28(3)
[Sch. For. Resour., Univ. Ga., Athens 30602] The preferred temperatures of juveniles of four embiotocid species were determined in a laboratory gradient apparatus. Juvenile *Embiotoca jacksoni* and *Micrometrus minimus* preferred warmer water than adults, although adults and juveniles of both species coincided in field occurrence. *Hypsurus caryi* adults and juveniles preferred equivalent temperatures. Neonate *Cymatogaster aggregata* preferred colder water than adults. Therefore, thermal preference was not a species characteristic but varied ontogenetically. There was agreement between temperatures occupied under gradient conditions and acute laboratory preferred temperatures for juveniles of all species except *C. aggregata*, which preferred cooler temperatures than actually occupied.

83-001605 Stacey, N. E. and A. L. Kyle. EFFECTS OF OLFACTORY TRACT LESIONS ON SEXUAL AND FEEDING BEHAVIOR IN THE GOLDFISH. *Physiol. Behav.* 30(4):621-628. Apr. 1983. SFA 28(3)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada] The paired olfactory tracts (OTs) of goldfish each have a lateral (LOT) and medial (MOT) olfactory tract, the latter with medial (mMOT) and lateral (lMOT)

BEHAVIOR (CONTINUED)

83-001605 CONTINUED subdivisions. Bilateral OT section (OTX) reduced, while unilateral OT section (UNI) did not impair, male sexual behavior and feeding responses to a complex food odor; in contrast, female sexual behavior, induced in both sexes by prostaglandin treatment, was little affected by OTX. Experiments in which control fish were given UNI and treatment groups received UNI plus selective section of the remaining OT assessed the role of the OT subdivisions in the two olfactory-influenced behaviors (male sexual behavior and feeding). LOT section did not affect courtship, while MOT section reduced courtship to the low levels seen in OTX males; within the MOT, the mMOT may be more important than the lMOT for courtship expression. In contrast to male sexual behavior, feeding responses were less affected by MOT than LOT section. With respect to male sexual behavior, these findings demonstrate differential functions for the anatomically distinct subdivisions of the goldfish olfactory tracts, possibly related to their distinct terminal fields within the telencephalon.

83-001606 Van den Berg, A. V. and A. Schuijf. DISCRIMINATION OF SOUNDS BASED ON THE PHASE DIFFERENCE BETWEEN PARTICLE MOTION AND ACOUSTIC PRESSURE IN THE SHARK *CHILOSCYLLIUM GRISEUM*. *Proc. R. Soc. Lond. B Biol. Sci.* 218(1210):127-134. 22 Apr. 1983. SFA 28(3)

[Lab. Comp. Physiol., State Univ. Utrecht, 40 Jarr van Galenstr. 3572 LA Utrecht, Netherlands] The reported psychophysical study indicates that a shark not only detects particle motion in a sound field (f = 84 Hz) but moreover shows a sensitivity to acoustic pressure. These results are remarkable because sharks lack a gas bladder that can act as a pressure-to-displacement transformer enabling the hair cells in the labyrinths to respond to acoustic pressure indirectly. The probable significance of the observed phenomena for acoustic localization in fish is discussed and a possible pressure-to-displacement transformer in shark is proposed.

83-001607 Weld, M. M. and A. H. Meier. THERMOPERIODISM IN THE GULF KILLIFISH, *FUNDULUS GRANDIS*. *J. Exp. Zool.* 226(2):185-191. May 1983. SFA 28(3)

[Dep. Zool. Physiol., La. State Univ., Baton Rouge 70803] Male Gulf killifish, *Fundulus grandis*, were held on various photoperiodic and thermoperiodic regimens for 2 to 4 weeks and examined with respect to body fat stores and testes weights. Groups of fish kept on a 24-hr (LD 12:12) photoperiodic regimen were provided a water temperature of 28°C except for a 4-hr daily interval of 20°C given at one of six different times during the photocycle. Similarly, fish kept on a 48-hr (LD 12:36) photocycle and 28-30°C were provided 4-hr cryophases (20°C) once during each photocycle in various phase relations to the photoperiodic regimen. In addition, some groups were held at 20°C and provided 4-hr thermophase (28-30°C) interruptions. Fat stores and gonad weights varied among the groups as a function of the time of day when the temperature interruptions occurred. The photoperiod appears to entrain a circadian rhythm of thermosensitivity, so that the coincidence of a temperature change with a thermosensitive phase alters metabolic and reproductive indices. The circadian mechanism in the thermoperiodism appears similar to that involved in photoperiodism.

83-001608 Yarvik, A. R. and V. B. Murav'yev. THE SCHOOL STRUCTURE OF THE BALTIC HERRING, *CLUPEA HARENGUS MEMBRAS* (CLUPEIDAE), IN THE TRAP NET ZONE. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(4):88-96. 1982. SFA 28(3)

[Baltic Fish. Res. Unit, Tallin, USSR] Experimental investigations were carried out in the zone of action of trap nets by underwater observation and

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83-001608 CONTINUED photorecording. The method of calculating the volume density of the school is based on the introduction of the theoretical concept of "vacuum prisms". The spawning concentration of the spring Baltic herring has all the characters of a typical migratory school and retains its structure at a light intensity at the depth of the fish run of up to $10^{-3} \div 10^{-4}$ lux.

LIFE HISTORY-GENERAL WORKS

83-001609 Bailey, J. E.; B. L. Wing and J. H. Landingham. JUVENILE PACIFIC SANDFISH, *TRICHODON TRICHODON*, ASSOCIATED WITH PINK SALMON, *ONCORHYNCHUS GORBUSCHA*, FRY IN THE NEARSHORE AREA, SOUTHEASTERN ALASKA. *Copeia* 1983(2):549-551. 6 May 1983. SFA 28(3)
[NMFS, Auke Bay, AK 99821]

83-001610 Costa, M. J. FOOD AND SEXUAL MATURITY OF *DICENTRARCHUS LABRAX* (PISCES; SERRANDIAE) IN «TEJO ESTUARY». *Arq. Mus. Bocage Ser. B* 1(1):1-7. 1981. SFA 28(3)
[Cent. Fauna, Univ. Lisbon, Portugal]

83-001611 Cowx, I. G. THE BIOLOGY OF BREAM, *ABRAMIS BRAMA* (L), AND ITS NATURAL HYBRID WITH ROACH, *RUTILUS RUTILUS* (L), IN THE RIVER EXE. *J. Fish Biol.* 22(6):631-646. June 1983. SFA 28(3)
[Dep. Biol. Sci., Univ. Exeter, England] Hybrids between bream, *Abramis brama*, and roach, *Rutilus rutilus*, occur in the lower reaches of the River Exe and were positively identified by their meristic features and shape of the pharyngeal bone. The growth of bream and hybrids were determined by back-calculation from scales. Annual checks were laid down in early June. The mean length of age of female bream was significantly larger than that of males for fish 6 years of age and older. This divergence in growth rate was associated with the sexual maturation of the fish. Data for the sexes were combined and compared with the growth rate of hybrids and roach from the same region. Hybrid growth was similar to that of bream for the first 6 years of life but was intermediate between that of the two parent species of the older age groups. Some hybrids with developing gonads were found. A change in the diet of bream from planktonic feeding to a benthophagic habit with age was noted. Detritus, substrate and chironomid larve formed the bulk of the diet of hybrids.

83-001612 Dasgupta, M. and S. A. K. Nasar. PRELIMINARY OBSERVATIONS ON THE BIOLOGY OF THE JUVENILE OF *BARILIUS BENDELISIS* HAM, FROM RIVER SIMSANG, MEGHALAYA (INDIA). *Arq. Mus. Bocage Ser. B* 1(2):9-17. 1981. SFA 28(3)
[Dep. Zool., Sch. Life Sci., North-Eastern Hill Univ., Shellong 793014, India]

83-001613 Gon, O. and A. Ben-Tuvia. THE BIOLOGY OF BOYER'S SAND SMELT, *ATHERINA BOYERI* RISSO IN THE BARDAWIL LAGOON ON THE MEDITERRANEAN COAST OF SINAI. *J. Fish Biol.* 22(5):537-547. May 1983. SFA 28(3)
[Dep. Zool., Hebrew Univ. Jerusalem, Jerusalem, Israel] The present study described some aspects of the life history of Boyer's sand smelt *Atherina boyeri* in the hypersaline Bardawil Lagoon on the Mediterranean coast of the

LIFE HISTORY-GENERAL WORKS (CONTINUED)

83-001613 CONTINUED Sinai peninsula, Egypt. Monthly samples were collected with a small-mesh experimental beach-seine during the years 1973-1974. Age determinations were based on otoliths readings and length frequency distributions which indicate that the Bardawil Lagoon population consists mostly of 0-age group. The largest recorded fish was 63 mm in standard length (S.L.). Length-weight relationship has been calculated as: $W=13.7 \times 10^{-6} \times L^{2.93}$ where *W=weight (g) and L*=S.L. (mm). *Atherina boyeri* mature at the length of 34 mm. Spawning takes place from March to September. The average number of eggs in the ovary of a ripe female at the beginning of the spawning season was found to be 522. Females of all sizes were more numerous than males. In immature fish, less than 34 mm long, females constituted 53% of the population. In larger fish the number of females was higher; in fish over 34 mm long females constituted 64% and in fish over 51 mm--96%. *Atherina boyeri* in the Bardawil Lagoon feeds on both zoobenthos and zooplankton, mainly amphipods and copepods. Polychaetes, mysidaceans, insects and fish were also represented. *Atherina boyeri* is the host of endoparasitic Trematoda, Acanthocephala and Nematoda. The examined fish were found to have metacercaria in their mesenteries and liver.

83-001614 Hatch, J. T. LIFE HISTORY OF THE GILT DARTER, *PERCINA EVIDES* (JORDAN AND COPELAND), IN THE SUNRISE RIVER, MINNESOTA. *Ph.D. dissertation, Univ. Minn.* 162p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(11):3502. May 1983. SFA 28(3)

The life history of the gilt darter, *Percina evides*, was studied from April 1977 to May 1981. One population in the Sunrise River, Chisago County, Minnesota was studied intensively and 5 other populations in the St. Croix River drainage of Minnesota were studied less intensively. Gilt darters occurred exclusively in the St. Croix River and 3 of its larger tributaries. In summer, gilt darters were most abundant in cobble raceways of moderate to swift current (0.5-1.2 m/sec) with little aquatic vegetation. They exhibited a marked winter migration from cobble raceways to the deeper, swifter portions of rubble riffles. Siltation appeared to be a major factor limiting their distribution in Minnesota. Sunrise River gilt darters spawned in cobble raceways from June to mid-July in waters of 17-23°C. Both sexes reached sexual maturity at about 50mm standard length (11-13 months for males and 22-23 months for females). Based on total mature ova counts, fecundity ranged from 132 to 397 and was strongly correlated with size and age. The life span was 3 years; males and females had equal survivorship. Embryonic and larval periods lasted less than 2 weeks, and in both sexes 58-68% of maximum length was attained in the first year. Males grew faster than females, and disparity in size between the sexes increased with age. There was some evidence of growth compensation and a tendency for slow growth to be associated with longevity. Sex ratio was 1:1 throughout the juvenile and adult periods. Gilt darters exhibited several derived reproductive states including establishment of a fixed territory, ritualized agonistic behavior, pronounced sexual dimporphism, reduced egg production, and yellow orange egg color. The diet consisted almost entirely of immature Ephemeroptera (46%), Diptera (43%), and Trichoptera (10%), but changed seasonally and with age. Gilt darters were diurnal feeders and exhibited a marked seasonal change in feeding intensity. Based on analyses of 14 characters, St. Croix River gilt darters were considered to be a meristically distinct race of *Percina evides evides*.

83-001615 Ikusemiju, K.; A. A. Oki and M. Graham-Douglas. ON THE BIOLOGY OF AN ESTUARINE POPULATION OF THE CLUPEID *PELLONULA AFZELIUSI* (JOHNELS) IN LAGOS LAGOON, NIGERIA. *Hydrobiologia* 102(1):55-59. 20 May 1983. SFA 28(3)

[Dep. Biol. Sci., Univ. Lagos, Lagos, Nigeria] The length-weight relationship, condition factor, fecundity and food and feeding habits of

LIFE HISTORY-GENERAL WORKS (CONTINUED)

83-001615 CONTINUED *Pellonula afzeliusi* (Johnels) in Lagos Lagoon were investigated. The standard length of 1832 specimens examined ranged between 3.5 and 9.4 cm (total length 3.9 cm-11.4 cm) and was larger than reported elsewhere in West African man-made lakes. Specimens exhibited positive allometric growth. Their condition factor increased with individual size. Females had a slightly higher condition factor than males. The number of mature ova per female ranged between 330 and 33,649. There was a higher correlation between fecundity and weight than between fecundity and length. The major food items were crustaceans, insects and fishes. There were distinct differences in the feeding habits in relation to size. Variations were observed in the monthly analysis of food items.

83-001616 Kawasaki, T.; H. Hashimoto; H. Honda and A. Otake. SELECTION OF LIFE HISTORIES AND ITS ADAPTIVE SIGNIFICANCE IN A SNAILFISH *LIPARIS TANAKAI* FROM SENDAI BAY. *Bull. Jpn. Soc. Sci. Fish.* 49(3):367-377. Mar. 1983. SFA 28(3)

[Fac. Agric., Tohoku Univ., Sendai 980, Japan] Growth rate of snailfish is very high, eggs produced in late December-January becoming 400 mm in body length for male and 320 mm for female in the same period of the next year, and their life span is one year. Food habits shift from "number selection" depending mainly on crustaceans to "size selection" relying in particular on sandeel in October when growth is the fastest. Spawning seems to be carried out in several batches of eggs 1.4-1.5 mm across and the fertility is estimated to be a hundred thousand and tens of thousands. Snailfish supposedly raises the probability for eggs to survive through caring for them by their fathers. Short life of snailfish along with parental care for eggs brings about a rise of the intrinsic rate of natural increase r_m, resulting in an elaborate regulation of population numbers.

83-001617 Kotylar, A. N. and A. A. Abramov. SOME BIOLOGICAL PROPERTIES OF PERUVIAN MACKEREL, *SCOMBER JAPONICUS PERUANUS* (SCOMBRIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(6):91-101. 1982. SFA 28(3)

[VNIRO, Moscow, USSR]

83-001618 Kurenkov, S. I.; S. A. Gorshkov and T. I. Tolstyak. DISTRIBUTION AND BIOLOGY OF THE FRESHWATER COHO SALMON, *ONCORHYNCHUS KISUTCH* (SALMONIDAE) IN KAMCHATKA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(6):70-78. 1982. SFA 28(3)

[KoTINRO, Petropavlovsk-Kamchatskiy, USSR] The freshwater coho, *Oncorhynchus kisutch*, lives in lagoon-type lakes, partly or completely cut off from the sea. It matures in the second to the fifth year of life. Lengths at maturity range from 20-53 cm, weight between 120 and 2,100 g, absolute fecundity between 600 and 2,000 eggs. A characteristic feature of the freshwater coho salmon is the very high rate of growth in the prespawning spring-summer season. The broad feeding spectrum, resistance to relatively high temperatures, and high rate of growth recommend this form for artificial propagation and acclimation.

83-001619 Mills, C. A.; J. S. Welton and E. L. Rendle. THE AGE, GROWTH AND REPRODUCTION OF THE STONE LOACH *NOEMACHEILUS BARBATULUS* (L.) IN A DORSET CHALK STREAM. *Freshwater Biol.* 13(3):283-292. June 1983.

[Freshwater Biol. Assoc., River Lab., East Stoke, Wareham, Dorset, England] In this highly productive chalk stream the stone loach, sampled by electrofishing over a 30 month period, had a high growth rate reaching a mean length of 65 mm in 1 year and 93 mm in 2 years. The fish were short-lived in contrast to most slow-growing populations in the U.K. and Finland with II group fish comprising 8.8% and III group fish only 1.1% of the total number.

LIFE HISTORY-GENERAL WORKS (CONTINUED)

83-001619 CONTINUED The loach were fractional spawners; a 75 mm female produced an estimated 10,620 eggs between late April and early August totalling 46% of the loach's initial weight. In March and April some small 0 group females contained only poorly developed eggs and up to 10% of 0 group fish may have failed to spawn. Amongst loach >52 mm in length in March and April there was an exponential relationship between absolute fecundity and fish length but no relationship between relative fecundity and length. There was, however, a relationship between fish length and both gonadosomatic index and maximum egg size, whcih may indicate that large fish began to spawn first.

83-001620 Moreau, J. EXPOSE SYNOPTIQUE DES DONNEES BIOLOGIQUES SUR LA PERCHE DU NIL LATES *LATES NILOTICUS* (LINNAEUS, 1762). [SYNOPTIC REPORT OF BIOLOGICAL DATA OF THE NILE PERCH *LATES NILOTICUS* (LINNAEUS, 1762).] *FAO Synop. Peches* No. 132. vi + 44p. 1982. In French. SFA 28(3)
[Lab. Ichtyol. Appl., Ecol. Natl. Super. Agron., 145 ave de Muret, 31076 Toulouse Cédex, France]

83-001621 Nebraska Game and Parks Commission. THE MISSOURI RIVER CHANNEL CATFISH. *Nebr. Game Parks Comm. Tech. Ser.* No. 11. 81p. 1982. SFA 28(3)
[P.O. Box 30370, Lincoln 68503]

83-001622 Prince, J. D. and I. C. Potter. LIFE-CYCLE DURATION, GROWTH AND SPAWNING TIMES OF FIVE SPECIES OF ATHERINIDAE (TELEOSTEI) FOUND IN A WESTERN AUSTRALIAN ESTUARY. *Aust. J. Mar. Freshwater Res.* 34(2):287-301. 1983. SFA 28(3)
[Sch. Environ. Life Sci., Murdoch Univ., Murdoch, W.A. 6150, Australia] Five species of atherinid were collected monthly from the estuary of the Swan-Avon river system. Length-frequency data and gonadosomic indices showed that *Atherinosoma presbyteroides, A. elongata, A. walacei* and *Allanetta mugiloides* typically have a 1-year life cycle and generally reach maturity at total lengths of 40-85 mm. The mean length of the mature females was significantly greater than that of the mature males in each *Atherinosoma* species, but not in *Allanetta mugiloides*. The fifth species, *Pranesus ogilbyi*, was often represented by many individuals with far greater total lengths (100-150 mm) than were found in the other four species, a feature that reflected the presence of two year classes. Length-frequency and gonadosomic data indicated that all five atherinid species breed over protracted periods during spring and summer. Values for the gonadosomic index and the absence of local marine populations of *Atherinosoma elongata, Allanetta mugiloides* and *Atherinosoma wallacei* confirmed that the populations of these species in the Swan-Avon are estuarine or estuarine-inland water *sensu stricto*. Gonadosomic values for the marine species *A. presbyteroides* and *P. ogilbyi*, allied with the times of disappearance of larger individuals from the estuary, suggested that only the former of these two species may breed to an extent in the estuary. Length-frequency histograms showed that the populations of *A. presbyteroides* and *P. ogilbyi* in the Swan-Avon are more heterogeneous than those of the same species in a nearby marine embayment.

83-001623 Ré, P. and A. J. Almeida. OBSERVATIONS ON THE BIOLOGY OF *OPHIOBLENNIUS ATLANTICUS ATLANTICUS* (VALENCIENNES IN CUV. & VAL., 1836), (PISCES: BLENNIIDAE) FROM THE AZORES. *Arq. Mus. Bocage Ser. B* 1(5):41-50. 1981. SFA 28(3)
[Inst. Nac. Invest. Cient., Lisbon, Portugal]

LIFE HISTORY-GENERAL WORKS (CONTINUED)

83-001624 Sigler, W. F.; W. T. Helm; P. A. Kucera; S. Vigg and G. W. Workman. LIFE HISTORY OF THE LAHONTAN CUTTHROAT TROUT, *SALMO CLARKI HENSHAWI*, IN PYRAMID LAKE, NEVADA. *Great Basin Nat.* 43(1):1-29. 31 Jan. 1983. SFA 28(3)

[P.O. Box 1350, Logan, UT 84322] The Pyramid Lake Lahontan cutthroat trout (*Salmo clarki henshawi*) population was sampled on a monthly basis from November 1975 through December 1977. Subsample of 676 trout, stratified by fish size and lake habitat, provided biological data. The entire population is presently derived from hatchery production, stocked at lengths of approximately 75 to 300 mm. Peak annulus formation occurs in March and April, followed by the period of maximum growth. Scale patterns illustrate a variable growing season. Maximum growth in length is in the first three years of life; after that males begin to grow faster than females. Males attained a greater age in our sample; i.e., the oldest male was seven years old compared to six years for females. The Pyramid Lake Lahontan cutthroat trout exhibit nearly isometric growth. The legal sport fishery removed <20,000 adult fish in 1977 (>380 mm); other decimating factors are poorly understood. No evidence of the following diseases or pathogens was found in the Pyramid Lake population, presuming a carrier incidence of 2 percent at the 95 percent confidence level: infectious pancreatic necrosis, infectious hematopoietic necrosis, viral hemorrhagic septicema, bacterial kidney disease, enteric redmouth, furunculosis, whirling disease, blood fluke; however, 7 of 235 (≅ 3 percent) adults sampled at the Marble Bluff fishway were positive for furunculosis. Small trout feed primarily on zooplankton and benthic invertebrates; cutthroat trout >300 mm are piscivorous, feeding almost exclusively on tui chub (*Gila bicolor*). The spawning migration of Pyramid Lake cutthroat trout to the Marble Bluff egg taking facility in spring 1976 and 1977 peaked in April and May. Females mature at three or four years (352-484 mm), and males mature at two or three years (299-445 mm). Mean diameter of mature eggs is 4.51 mm; both ovum size and fecundity are a function of fish size. Fecundity ranges from 1241 to 7963 eggs, with a mean of 3815. Lahontan cutthroat trout comprise <2 percent of the numerical relative abundance and <7 percent of the total fish biomass. Distribution patterns vary on a seasonal basis, with maximum activity during late fall and and winter. Management objectives are presented and recommendations are discussed.

83-001625 Stevens, J. D. and G. J. Cuthbert. OBSERVATIONS ON THE IDENTIFICATION AND BIOLOGY OF *HEMIGALEUS* (SELACHII: CARCHARHINIDAE) FROM AUSTRALIAN WATERS. *Copeia* 1983(2):487-497. 6 May 1983. SFA 28(3)

[Div. Fish. Res., CSIRO Mar. Lab., P.O. Box 21, Cronulla NSW 2230, Australia] Seventy one specimens of a hemigaleine shark were examined from northern Australian waters. This species is referable to the genus *Hemigaleus* of which *H. microstoma* is the sole representative. The Australian specimens were tentatively identified as *H. microstoma*, but tooth and vertebral counts differ widely from those reported previously for this species. Males reach sexual maturity at 600 mm TL, females between 600 and 650 mm TL. *H. microstoma* exhibits placental viviparity; litter sizes vary from 4 to 14, and size at birth is 260-280 mm TL. *H. microstoma* appears to be a highly selective feeder, preying mainly on octopus.

83-001626 Taber, C. A. and B. A. Taber. REPRODUCTIVE BIOLOGY AND AGE AND GROWTH OF THE MISSOURI SADDLED DARTER *ETHEOSTOMA TETRAZONUM*. *Am. Midl. Nat.* 109(2):222-229. Apr. 1983. SFA 28(3)

[Biol. Dep., Southwest Mo. State Univ., Springfield 65802] Populations of Missouri saddled darters in the Niangua River and the Pomme de Terre River of SW Missouri were compared with respect to age and growth, reproductive cycles and fecundity. Females typically contained maturing clutches of 40-50 ova and spawned periodically from mid-March to July. Reproductive activity was interrupted in late april when heavy rains produced high stream flows.

LIFE HISTORY-GENERAL WORKS (CONTINUED)

83-001626 CONTINUED Darters in the smaller Pomme de Terre River were larger at a given age and in better condition than those in the Niangua River. The number of maturing ova present in females of both rivers was very similar. Maximum longevity for both sexes was 4 years with sexual maturity attained at 1 year in females and after 2 years in males. The length of the spawning period and the production of many small clutches of eggs enhance the reproductive success of this species in an unpredictably fluctuating riffle habitat.

83-001627 Timmons, T. J.; J. S. Ramsey and B. H. Bauer. LIFE HISTORY AND HABITAT OF THE BLACKFIN SUCKER, *MOXOSTOMA ATRIPINNE* (OSTEICHTHYES: CATOSTOMIDAE). *Copeia* 1983(2):538-541. 6 May 1983. SFA 28(3)
[Dep. Biol. Sci., Murray State Univ., Murray, KY 42071]

83-001628 Volbuyev, V. V. and A. Y. Rogatnykh. ECOLOGICAL AND MORPHOLOGICAL DESCRIPTION OF COHO SALMON, *ONCORHYNCHUS KISUTCH* (SALMONIDAE), FROM THE CONTINENTAL COAST OF THE SEA OF OKHOTSK. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(6):79-85. 1982. SFA 28(3)
[Magadan Dep., Pac. Res. Inst. Sea Fish. Oceanogr., USSR] Information is given on the types and nature of the spawning migration and reproduction of the coho salmon, *Oncorhynchus kisutch*. A description is given of its external characters and certain morphological differences are revealed between populations from rivers differing as regards hydrology. The size-weight indices of the young and their feeding during the summer period were determined. A similarity with the coho salmon of other regions of the Far East is noted in the characteristics examined.

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC.

83-001629 Cook, R. C. ESTIMATING THE MIXING PROPORTION OF SALMONIDS WITH SCALE PATTERN RECOGNITION APPLIED TO SOCKEYE SALMON (*ONCORHYNCHUS NERKA*) IN AND AROUND THE JAPANESE LANDBASED DRIFTNET FISHERY. *Ph.D. dissertation, Univ. Wash.* 278p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(10):3099. Apr. 1983. SFA 28(3)

83-001630 Craig, J. F. and C. Kipling. REPRODUCTION EFFORT VERSUS THE ENVIRONMENT; CASE HISTORIES OF WINDERMERE PERCH, *PERCA FLUVIATILIS* L., AND PIKE, *ESOX LUCIUS* L. *J. Fish Biol.* 22(6):713-727. June 1983. SFA 28(3)
[Alberta Environ. Cent., Bag 4000, Vegreville, AB T0B 4L0, Canada] The theoretical limits of net reproduction rates for perch, *Perca fluviatilis* L. and pike, *Esox lucius* L., have been estimated from the upper and lower limits of fecundity, growth, mortality, age of maturity and biomass of parental stock, observed in Windermere over 40 years. Differences in egg numbers due to changes in fecundity were for perch X 1.5, for pike X 2. Assuming the same mortality, a fast growing cohort would produce more eggs during its lifespan than a slow growing, for perch X 2, for pike X 9. Changes in mortality from high to low resulted in more eggs, for perch X 7, and for pike (where high mortality includes natural and fishing mortality) X 10. Change in age at first maturity from 3 to 2 years was unimportant. Biomass of parental stock varied by X 6 for perch and X 3 for pike, and number of eggs laid varied by X 2 for perch and X 5 for pike. The number of recruits at age 2 years varied by X 300 for perch and X 7 for pike. It was concluded that temperature in the first summer of life and predation were of major importance in regulating the number of recruits. Ricker recruitment curves and a simple model showed that perch, but not pike, could produce maximum

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

83-001630 CONTINUED recruitment from minimum parental stock. For perch, but not pike, compensatory density dependent mortality increased with increased parental stock It was concluded that responses by the perch and pike populations to a changing environment cannot be of sufficient magnitude to prevent wide fluctuations in recruitment.

83-001631 Deriso, R. B. and T. J. Quinn II. THE PACIFIC HALIBUT RESOURCE AND FISHERY IN REGULATORY AREA 2. II. BIOMASS, SURPLUS PRODUCTION, AND REPRODUCTIVE VALUE OF THE PACIFIC HALIBUT POPULATION IN AREA 2. *Inst. Pac. Halibut Comm. Sci. Rep.* No. 67. p. 55-89. 1983. SFA 28(3)
[Inst. Pac. Halibut Comm., P.O. Box 95009, University Stn., Seattle, WA 98105]

83-001632 Garnås, E. and T. Hesthagen. THE POPULATION OF BROWN TROUT (*SALMO TRUTTA* L.) IN SOME REGULATED LAKES IN SOUTHERN NORWAY. *Inst. Freshwater Res. Drottningholm Rep.* No. 60. p. 25-30. 1982. SFA 28(3)
[Dir. Wildl. Freshwater Fish, Elgesetergate 10, N-7000 Trondheim, Norway] A total of 49 trout lakes exposed to different levels of water impoundment, were studied with respect to catch per effort, length-age composition, and several growth parameters. The results were based on sampling with standard net series once in each lake. There were slight negative correlations between catch per effort, mean weight and growth with increasing water amplitude. However, due to great variations in values at all regulation levels, the correlations were not significant. As for age and length composition, there was a tendency of increasing share of older and smaller fish with increasing impoundment.

83-001633 Gilliam, J. F. HABITAT USE AND COMPETITIVE BOTTLENECKS IN SIZE: STRUCTURED FISH POPULATIONS. *Ph.D. dissertation, Mich. State Univ.* 118p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(12):3832. June 1983. SFA 28(3)

83-001634 Godø, O. R. FORSKJELLER I GYTEPOPULASJONANE AV NORSK-ARKTISK TORSK PÅ MØREKYSTEN OG I LOFOTEN. [DIFFERENCES IN THE SPAWNING POPULATIONS OF NORWEGIAN-ARCTIC COD AT THE MØRE COAST AND IN LOFOTEN.] *Fisken Havet* 1983(1):29-35. 1983. In Norwegian with English summ. SFA 28(3)
[Inst. Mar. Res., Bergen, Norway]

83-001635 Gowan, R. E. POPULATION DYNAMICS AND EXPLOITATION RATES OF ROCKFISH (*SEBASTES* SPP.) IN CENTRAL PUGET SOUND, WASHINGTON. *Ph.D. dissertation, Univ. Wash.* 112p. 1983. From Diss. Abstr. Int. B Sci. Eng. 43(12):3827. June 1983. SFA 28(3)
Rockfish in central Puget Sound have become an increasingly valued recreational resource. Present levels of effort directed towards these fish are such that some species may be overexploited in the near future. Age and growth parameters for selected species were determined from specimens collected from Puget Sound. Age frequencies of the specimens were used to estimate age at full recruitment, and total mortality rate. A tagging study was conducted at a site in central Puget Sound to estimate fishing and natural mortality rates and the migratroy behavior of adult rockfish. Concurrent with the tagging study a creel census was conducted in the study area to estimate angler effort directed towards the tagged specimens. The results of the tagging and creel census were used to estimate total harvest

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

83-001635 CONTINUED and catchability coefficients for four species of rockfish (copper rockfish, *Sebastes caurinus*; brown rockfish, *S. auriculatus*; quillback rockfish *S. maliger*; and black rockfish, *S. melanops*). A Beverton-Holt (1957) yield analysis was modified so that the effect of fishing on all *Sebastes* spp. could be evaluated as a function of a single parameter, fishing effort. The results of the analysis show that no species is at present overexploited, but that yield is close to maximum.

83-001636 Iyevleva, M. Y. EARLY PREDICTION OF THE AGE STRUCTURE IN THE SPAWNING POPULATION OF *ONCORHYNCHUS NERKA* (SALMONIDAE) IN THE OZERNAYA RIVER (KAMCHATKA). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(6):52-61. 1982. SFA 28(3)

[KoTINRO, Petropavlovsk-Kamchatskiy, USSR] Results are presented of a histologic analysis of the state of the testes of sockeye smolts migrating from Lake Kuril in 1965, 1968, 1976, and 1977. Two groups of migrants are distinguished (with accelerated and retarded development of the testes) and their histologic and morphological characteristics are given. The connection between the abundance of future early-maturing males and the size of the year-classes to which they belong is demonstrated. The possibility is discussed for using the proportion of future early maturing males in the composition of downstream migrants to predict the age structure of the sexually mature part of the Ozernaya River sockeye population.

83-001637 Khoroshko, A. I. POPULATION ABUNDANCE AND STRUCTURE IN THE LONG-FINNED MULLET (GENUS *LIZA*, MUGILIDAE) DURING ACCLIMATION IN THE CASPIAN SEA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(6):62-69. 1982. SFA 28(3)

[KaspNIKRH, Krasnovodsk, USSR]

83-001638 Konobeev, A. G.; V. G. Tereshchenko and A. S. Strel'nikov. DYNAMICS OF AGE STRUCTURE OF BREAM IN THE RIVERBED SECTIONS OF RYBINSK RESERVOIR. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(6):147-150. 1982. SFA 28(3)

[Inst. Biol. Inland Waters, Acad. Sci. USSR, Borok, Yaroslavl Dist., USSR]

83-001639 Kovtsova, M. V. SIZE-AGE STRUCTURE AND SEX RATIO OF THE BARENTS SEA POPULATION OF THE PLAICE, *PLEURONECTES PLATESSA* (PLEURONECTIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(4):68-79. 1982. SFA 28(3)

[PINRO, Murmansk, USSR]

83-001640 Light, J. T.; J. T. Windell and W. C. Nelson. THE VITAL STATISTICS OF UNEXPLOITED BROOK TROUT POPULATIONS IN ALPINE LAKES, FRONT RANGE, COLORADO. *J. Colo.-Wyo. Acad. Sci.* 14(1):14. Apr. 1982. Abstract only. SFA 28(3)

[Dep. EPO Biol., Univ. Colo., Boulder] The purpose of this study was to assess the vital statistics of the fish populations in an alpine watershed: the Green Lakes Valley. The existing resident fish populations have not been exploited for over 50 years as a result of restricted access and enforced management. The lakes range in elevation from 3,347 m (Albion) to 3,615 m (Green Lake No. 5). Surface area ranges from 13 ha (Albion) to 3.7 ha (Green Lake No. 1). Depth ranges from 16 m (Green Lake No. 2) to 8 m (Green Lakes Nos. 1 & 5). An initial gill-netting survey (Summer '81) indicated the

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

83-001640 CONTINUED absence of fish in Green Lakes Nos. 1, 4, and 5 and pure populations of brook trout (*Salvelinus fontinalis*) in Green Lakes Nos. 2 and 3 and Albion Lake. Length-weight frequency analysis indicated a mean weight of 131 g (.29 lb) and length of 245 mm (9.6"). The largest fish captured weighed 301 g and was 317 mm in length. Each of the three fish populations was dominated (61%) by fish ranging from 240 to 280 mm. Low mean annual water temperature, a short period of open water and short growing season is reflected in slow growth, small fish size, and low fish production.

83-001641 McGregor, A. J.; S. A. McPherson and S. L. Marshall. FEASIBILITY OF DETERMINING THE ORIGIN OF SOCKEYE SALMON (*ONCORHYNCHUS NERKA*) IN THE TAKU-SNETTISHAM GILLNET FISHERY USING SCALE PATTERN ANALYSIS, 1981-1982. *Alaska Dep. Fish Game Inf. Leafl.* No. 219. iv + 23p. May 1983. SFA 28(3)
[Alaska Dep. Fish Game, Div. Commer. Fish., Statewide Stock Biol. Group, Anchorage]

83-001642 Neve, L. C. and V. Moore. POPULATION ESTIMATES AND SIZE REGIMES OF CUTTHROAT AND BROOK TROUT IN DIAMOND, KENDALL, AND SPRING CREEKS, IDAHO. *Northwest Sci.* 57(2):85-90. May 1983. SFA 28(3)
[Ecol. Br., U.S. Army, APG, MD 21010] Population estimates of size regimes were determined for cutthroat (*Salmo clarki*) and brook trout (*Salvelinus fontinalis*) populations during 1976 and 1977 at Diamond, Kendall, and Spring creeks, Idaho, to determine if these streams are extensively used as spawning grounds and rearing areas for the Blackfoot River and Blackfoot Reservoir trout fishery. Spring and Kendall creeks supported the largest trout densities, totaling over 4780 and 2264 fish/km. Three stations were sampled on Diamond Creek, of which only Station 1 consistently contained over 1000/km. Stations 2 and 3 had low trout densities and were effected by cattle grazing. Reproduction was observed in November 1976 at all three streams for brook trout, whereas cutthroat trout spawned in June and July 1977. Mean standard length values for cutthroat trout at Spring Creek were always below 100 mm. This trend of large populations of small fish was also observed at Kendall and Diamond creeks, indicating that the three streams were used as rearing grounds and spawning areas.

83-001643 Sharr, S. SEPARATING MAJOR RUNS IN THE COPPER-BERING RIVER SOCKEYE SALMON (*ONCORHYNCHUS NERKA*) FISHERY WITH SCALE PATTERN ANALYSIS. *Alaska Dep. Fish Game Inf. Leafl.* No. 218. iv + 23p. May 1983. SFA 28(3)
[Alaska Dep. Fish Game, Div. Commer. Fish., Statewide Stock Biol. Group, Anchorage]

83-001644 Smith, D. C. ANNUAL TOTAL MORTALITY AND POPULATION STRUCTURE OF JACKASS MORWONG (*NEMADACTYLUS MACROPTERUS* BLOCH & SCHNEIDER) IN EASTERN AUSTRALIAN WATERS. *Aust. J. Mar. Freshwater Res.* 34(2):253-260. 1983. SFA 28(3)
[New South Wales Fish., P.O. Box N211, Grosvenor Street, Sydney, N.S.W. 2000, Australia] Catch curves were analysed to estimate the annual total mortality of jackass morwong landed at the port of Eden between July 1976 and June 1979. The annual total mortality of females was lower in 1978-1979 than in the previous 2 years, reflecting the expansion of the trawl fishery in New South Wales to include previously unexploited deepwater grounds. Males were fully recruited to the commercially exploited population at an earlier age than females. It is suggested that the increased mortality in older males is due to an increase in natural mortality.

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

83-001645 Van Alen, B. W. FEASIBILITY OF SALMON ENHANCEMENT PROGRAMS IN THE INDIAN LAKE SYSTEM, SOUTHEASTERN ALASKA, WITH EMPHASIS ON POPULATION CHARACTERISTICS OF RESIDENT DOLLY VARDEN CHAR, *SALVELINUS MALMA* (WALBAUM). *Alaska Dep. Fish Game Inf. Leafl.* No. 215. vii + 96p. Mar. 1983. SFA 28(3)
[Alaska Dep. Fish Game, Div. Commer. Fish., Anchorage]

83-001646 Wilkins, M. E. and J. T. Golden. CONDITION OF THE PACIFIC OCEAN PERCH RESOURCE OFF WASHINGTON AND OREGON DURING 1979: RESULTS OF A COOPERATIVE TRAWL SURVEY. *N. Am. J. Fish Manage.* 3(2):103-122. 1983. SFA 28(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

83-001647 Winters, G. H. ANALYSIS OF THE BIOLOGICAL AND DEMOGRAPHIC PARAMETERS OF NORTHERN SAND LANCE, *AMMODYTES DUBIUS*, FROM THE NEWFOUNDLAND GRAND BANK. *Can. J. Fish. Aquatic Sci.* 40(4):409-419. Apr. 1983. In English with French summ. SFA 28(3)
[Northwest Atl. Fish. Cent., P.O. Box 5667, St. Johns, NF A1C 5X1, Canada]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

83-001648 Andrade, D. R. and H. P. Godinho. ANNUAL MALE REPRODUCTIVE CYCLE OF THE BRAZILIAN TELEOST FISH *LEPORINUS SILVESTRII* (BOULENGER, 1902). *Arch. Biol. Morphol. Exp. Comp.* 94(1):1-14. 1983. SFA 28(3)
[Dep. Anim Biol., Fed. Univ. Vicosa, Vicosa, M.G., Brazil]

83-001649 Beamish, F. W. H. and E. J. Thomas. POTENTIAL AND ACTUAL FECUNDITY OF THE "PAIRED" LAMPREYS, *ICHTHYOMYZON GAGEI* AND *I. CASTANEUS*. *Copeia* 1983(2):367-374. 6 May 1983. SFA 28(3)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

83-001650 Blumer, L. S. PARENTAL CARE AND REPRODUCTIVE ECOLOGY OF THE NORTH AMERICAN CATFISH, *ICTALURUS NEBULOSUS*. *Ph.D. dissertation, Univ. Mich.* 159p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(10):3156. Apr. 1983. SFA 28(3)
The brown bullhead, *Ictalurus nebulosus*, is a freshwater catfish whose reproductive biology is characterized by parental care. In a north temperate lake (N45°37',W48°41'), bullheads bred only once each year, and matings were monogamous in each season. Experimental removal of adults from their broods demonstrated that parental attendance benefits offspring survival and that a major function of care-giving is to minimize predation. Parental care may also be important in facilitating gas exchange and minimizing fungal infection. Both sexes participate in care-giving but exhibit different activities. Males attended broods at closer distances than females and were the most frequent lone caregivers. However, females chased potential brood predators more frequently than males. This pattern of sex roles is the opposite of that found in the biparental cichlid fishes. The initial energetic costs of reproduction are much greater for females than males in the brown bullhead. Females spend a greater proportion of time away from the nest than males during the care-giving period, and females feed more than males during this time. Males may be predisposed to give care immediately following oviposition because the net benefits of care-giving are greater

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

83-001650 CONTINUED than the net benefits of leaving. Variation in female behavior suggests that among females the net benefits of care-giving are nearly balanced by the net benefits of leaving. Two care-givers were more successful than one alone in fostering offspring survival. However, there was no significant difference between two care-givers and one alone in the porportion of time broods were unattended. Two adults attended broods simultaneously during only 19% of the time that at least one adult was present. Males alone may sustain greater costs of care-giving than males aided by their mates. The differential success of two care-givers may be due to a difference in the likelihood that a male leaves the brood rather than differences in the quality of care one or two adults can provide.

83-001651 Bush, C. P. and J. S. Weis. EFFECTS OF SALINITY ON FERTILIZATION SUCCESS IN TWO POPULATIONS OF *FUNDULUS HETEROCLITUS*. *Biol. Bull.* 164(3):406-417. June 1983. SFA 28(3)
[J.S. Weis: Dep. Zool. Physiol., Rutgers Univ., Newark, NJ 07102]

83-001652 Cooper, A. THE REPRODUCTIVE BIOLOGY OF POOR-COD, *TRISOPTERUS MINUTUS* L., WHITING, *MERLANGIUS MERLANGUS* L., AND NORWAY POUT, *TRISOPTERUS ESMARKII* NILSSON, OFF THE WEST COAST OF SCOTLAND. *J. Fish Biol.* 22(3):317-334. Mar. 1983. SFA 28(3)
[Dunstaffnage Mar. Res. Lab., P.O. Box 3, Oban, Argyll PA34 4AD, Scotland]

83-001653 D'yakov, Y. P. THE FECUNDITY OF THE GREENLAND HALIBUT, *REINHARDTIUS HIPPOGLOSSOIDES* (PLEURONECTIDAE), FROM THE BERING SEA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(5):59-64. 1982. SFA 28(3)
[KoTINRO, Petropavlovsk-Kamchatskiy, USSR]

83-001654 Dempster, R. P. and W. F. Rohrs. SPAWNING RECORD OF THE LINGCOD, *OPHIODON ELONGATUS* (GIRARD, 1854), IN CAPTIVITY. *J. Aquaricult. Aquatic Sci.* 3(3):41-45. 1983. SFA 28(3)
[Steinhart Aquarium, Calif. Acad. Sci., Golden Gate Park, San Francisco, CA 94118] Observations were made on the spawning pattern and egg development of a pair of lingcod, *Ophiodon elongatus* (Girard, 1854). The large egg mass deposited by the female measures 45.7 cm x 33.0 cm. x 43.3 cm. A small sample of eggs was removed from the egg mass at regular intervals and preserved in 10 percent buffered formalin. After the eggs were thoroughly preserved and hardened in alcohol, the yolks with the attached embryos were removed from the egg shells, stained in Partsch's alum cochineal, and cleared in α-terpineol. Photomicrographs of the eggs, and the embryos in various stages of development, were taken and are shown in the text. Water temperature, pH, salinity, and water circulation rate were periodically recorded.

83-001655 Dyachuk, I. E. and T. P. Danilenko. MATURATION OF BREAM, *ABRAMIS BRAMA* (CYPRINIDAE), IN THE EARLY YEARS OF KANEV RESERVOIR. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(6):135-140. 1982. SFA 28(3)
[Inst. Hydrol., Acad. Sci. Ukranian SSR, Kiev, USSR] Data on sexual maturation of bream, *Abramis brama*, of Kanev Reservoir are reported. Sexual maturation of bream occurred at a later age after the final establishment of the reservoir. The length of first maturing males increased, within 4 years (1974-1977), from 27-28 to 31-32 cm, and the age from 3 to 5 years; the corresponding increases in the females were from 33 to 35 cm and

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

83-001655 CONTINUED from 4 to 5 years. The causes and possible consequences of this phenomenon are discussed.

83-001656 Forberg, K. G. MATURITY CLASSIFICATION AND GROWTH OF CAPELIN, *MALLOTUS VILLOSUS VILLOSUS* (M), OOCYTES. *J. Fish Biol.* 22(4):485-496. Apr. 1983. SFA 28(3)
[Inst. Fish., Univ. Tromso, Norway]

83-001657 Gale, W. F. FECUNDITY AND SPAWNING FREQUENCY OF CAGED BLUNTNOSE MINNOWS--FRACTIONAL SPAWNERS. *Trans. Am. Fish. Soc.* 112(3):398-402. May 1983. SFA 28(3)
[Ichthyological Assoc., Inc., R.D. 1, Berwick, PA 18603]

83-001658 Gartner, J. V., Jr. SEXUAL DIMORPHISM IN THE BATHYPELAGIC GULPER EEL *EURYPHARYNX PELECANOIDES* (LYOMERI: EURYPHARYNGIDAE), WITH COMMENTS ON REPRODUCTIVE STRATEGY. *Copeia* 1983(2):560-563. 6 May 1983. SFA 28(3)
[Dep. Mar. Sci., Univ. South Fla., St. Petersburg 33701]

83-001659 Golovanov, I. S. NATURAL REPRODUCTION OF PINK SALMON, *ONCORHYNCHUS GORBUSCHA* (SALMONIDAE) ON THE NORTHERN SHORE OF THE OKHOTSK SEA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(4):32-39. 1982. SFA 28(3)
[MOTINRO, Magadan, USSR] The first pink salmon spawners approach the north coast of the Okhotsk Sea at the end of June. The main part of the run in the rivers occurs in June and the spawning migration ends at the end of August. As regards spawning ecology, the north Okhotsk pink salmon differs from the pink salmon of other regions of the Asiatic coast of the Pacific in that it has the smallest spawning redds with a number of residual eggs in the body cavity of females not exceeding 5%. The times and dynamics of the downstream migration are almost the same as in the other regions of the Far East. However, its migrating young differ from the young of other regions: they are considerably smaller, their mean size is 30 - 31 mm and their mean weight 134 - 204 mg. A comparatively high natural reproductive efficiency is characteristic of the north Okhotsk pink salmon; the mean coefficient of downstream migration is 17.6%.--Concl.

83-001660 Greger, P. and J. E. Deacon. OBSERVATIONS ON WOUNDFIN SPAWNING AND GROWTH IN AN OUTDOOR EXPERIMENTAL STREAM. *Great Basin Nat.* 42(4):549-552. 31 Dec. 1982. SFA 28(3)
[Dep. Biol. Sci., Univ. Nev., Las Vegas 89154] The response of woundfin to different substrates and current speeds was investigated in an outdoor experimental stream. Fish spawned in groups of 15-20 over 5-10 cm rock substrate in a .06 to .09 m/sec current at a depth of 10 cm. Eggs were adhesive on the undersides of the rocks. Fish spawned under these conditions grew to approximately 55-60 mm TL in 5 months.

83-001661 Gritsenko, O. F. REPRODUCTION ECOLOGY OF THE EASTERN REDFINS OF GENUS *TRIBOLODON* (CYPRINIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(6):121-134. 1982. SFA 28(3)
[VNIRO, Moscow, USSR]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

83-001662 Hicks, B. J. and N. R. N. Watson. QUINNAT SALMON (*ONCORHYNCHUS TSHWAYTSCHA*) SPAWNING IN THE RANGITIKEI RIVER. *N.Z. J. Mar. Freshwater Res.* 17(1):17-19. 1983. SFA 28(3)
[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 297, Wellington, New Zealand]

83-001663 Kazakov, R. V.; I. G. Murza; S. A. Il'enkova and O. L. Kristoforov. FEMALES OF THE WINTER RACE OF ATLANTIC SALMON, *SALMO SALAR* (SALMONIDAE), IN THE NAROVA RIVER. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(5):160-163. 1982. SFA 28(3)
[GosNIORKH, Leningrad, USSR]

83-001664 Kovalevskaya, N. V. SUPERFLUOUS REPRODUCTION AND DEVELOPMENT OF FLYING FISHES OF THE FAMILY EXOCOETIDAE. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(4):48-54. 1982. SFA 28(3)
[IOAN, Moscow, USSR]

83-001665 Kulikova, N. I. and N. Y. Loshakova. OOGENESIS AND SEXUAL CYCLE OF THE LONG-FINNED MULLET, *LIZA AURATA* (MUGILIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(5):65-75. 1982. SFA 28(3)
[AzCherNIRO, Kerch, USSR]

83-001666 Lisovenko, L. A.; A. V. Barbanov and V. N. Yefremenko. NEW DATA ON THE REPRODUCTION OF THE "SOUTHERN PUTASSU", *MICROMESISTIUS AUSTRALIS* (GADIDAE), FROM THE FALKLAND-PATAGONIAN ZOOGEOGRAPHIC REGION. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(4):55-67. 1982. SFA 28(3)
[VNIRO, Moscow, USSR] The southern putassu of the Falkland-Patagonian region is characterized by a slight sexual dimorphism: females are slightly larger than males, they grow more rapidly and reach sexual maturity at larger sizes. The southern putassu spawns in the winter - spring period (August -September, in the region south-east of the Falkland (Malvinas) Islands; after spawning the females change over to stages VI - II and II of maturity. Spawning of the southern putassu is intermittent on the basis of a discontinuous type of oogenesis; number of batches 3 - 40. Dependence of fecundity on length may be described by the formula $F = L'^{2}$ and on weight by the formula $F = 15.3P^{1'4}$, where F is fecundity in number of eggs, L is length in cm and P is weight in g. The putassu of the Falkland-Patagonian region has a greater fecundity than the putassu of the New Zealand region.--Concl.

83-001667 Miller, R. J. and A. Jearld. BEHAVIOR AND PHYLOGENY OF FISHES OF THE GENUS *COLISA* AND THE FAMILY BELONTIIDAE. *Behaviour* 83(1-2):155-185. 1983. SFA 28(3)
[Dep. Zool., Okla. State Univ., Stillwater]

83-001668 Moyer, J. T.; R. E. Thresher and P. L. Colin. COURTSHIP, SPAWNING AND INFERRED SOCIAL ORGANIZATION OF AMERICAN ANGELFISHES (GENERA *POMACANTHUS*, *HOLACANTHUS* AND *CENTROPYGE*; POMACANTHIDAE). *Environ. Biol. Fishes* 9(1):25-39. 1 May 1983. SFA 28(3)
[Tatsuo Tanaka Mem. Biol. Stn., Ako, Miyake-jima 100-12, Japan]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

83-001669 Ross, M. R. THE FREQUENCY OF NEST CONSTRUCTION AND SATELLITE MALE BEHAVIOR IN THE FALLFISH MINNOW. *Environ. Biol. Fishes* 9(1):65-70. 1 May 1983. SFA 28(3)

[Dep. For. Wildl. Manage., Univ. Mass., Amherst 01003] The percentage of reproductively mature male fallfish that construct and defend nests is low (<10%), nesting activity normally being conducted only by the largest, and presumably oldest, males. Adult mortality rates suggest that most male fallfish reproduce during their life only by satellite activity at the nests of other males. A lesser degree of paternal certainty at the nests of male fallfish may be in part responsible for the greater amount of satellite male activity shown by this species than described in the literature for the closely related creek chub.

83-001670 Svärdson, G. and Å. Fagerström. ADAPTIVE DIFFERENCES IN THE LONG-DISTANCE MIGRATION OF SOME TROUT (*SALMO TRUTTA* L.) STOCKS. *Inst. Freshwater Res. Drottningholm Rep.* No. 60. p. 51-80. 1982. SFA 28(3)

[Inst. Freshwater Res., S-170 11 Drottningholm, Sweden] Tagging operations revealed the movements of four stocks of trout (*Salmo trutta* L.) in various Baltic Sea environments to which they were transported. The Dalälven stock proved to be coastal, with some incidence of straggling non-homing specimens. The Gullspång trout roamed about widely in open water, except in the cold Bothnian Bay, and had strong correlated homing behaviour. The downstream Verke trout had a NE-directed trend of movement and perfect homing. The upstream Verke trout is resident above waterfalls and did not migrate when transplanted. Evidence is presented for adaptation by natural selection in all cases. Selection for or against homing during repeated glacial periods is briefly discussed.

83-001671 Veshchev, P. V. REPRODUCTION OF STERLET, *ACIPENSER RUTHENUS* (ACIPENSERIDAE), IN THE LOWER VOLGA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(4):40-47. 1982. SFA 28(3)

[TsNIROKh, Astrakhan, USSR]

83-001672 Westerberg, H. ULTRASONIC TRACKING OF ATLANTIC SALMON (*SALMO SALAR* L.) - I. MOVEMENTS IN COASTAL REGIONS. *Inst. Freshwater Res. Drottningholm Rep.* No. 60. p. 81-98. 1982. SFA 28(3)

[Dep. Oceanogr., Univ. Gothenburg, P.O. Box 4038, S-400 40 Gothenburg, Sweden] Atlantic salmon have been tracked using ultrasonic transmitters in the archipelago and estuary of the presumed home river during their spawning migration. 21 trackings were made off the River Lule in the Bothnian Gulf, 7 off the River Klarälven in Lake Vänern. Tracking times ranged up to 40 hours (mean 16 hours) and the tracking distance was up to 60 km (mean 19 km). Approximately 60% of the trackings which lasted for more than 5 hours showed erratic movements, statistically not significantly different from random walk. For this group the net progress was slow (typically 10 km/day) and the resulting direction could be both towards and away from the river. All these erratic tracks were observed in the river estuary or in the inner-most archipelago. The behaviour is similar to that seen during the riverine phase of the migration. A high incidence of retrograde movements in one branch of the Lule estuary seems to be caused by pollution. The lesser group with a significant degree of oriented movement showed a net progress of approximately 25 km/day. In three cases, when recaptures made the river affiliation known or probable, the migration direction was towards the home river. The remaining 5 trackings show a direction away from the presumed home river. The observed cruising speed was in the range 0.5-1.0 body length/s. This speed is close to what theoretically would give a minimum energy consumption per unit distance travelled. Possible orientation cues are

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

83-001672 CONTINUED discussed and an experiment which shows that a salmon was sensitive to the presence of a weak magnetic field is presented. On numerous occasions the salmon were observed to detect and avoid traps and set nets. Detection was at approximately 10 m distance and seemed to be non-visual. A strong cooperation between different traps was noted. This means that a small increase in the number of salmon traps in the archipelago can have a considerable effect on the proportion of the total run which is caught in the river. Observations on swimming depth and behaviour in relation to the hydrography are discussed in an accompanying article.

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

83-001673 Godø, O. R. FORELØPIGE RESULTATER AV MERKEFORSØK PÅKYSTTORSK I OMRÅDET M ØRE-HELGELAND. [PRELIMINARY RESULTS OF COASTAL COD TAGGINGS IN THE MØRE-HELGELAND AREA.] *Fisken Havet* 1983(1):19-28. 1983. In Norwegian with English summ. SFA 28(3)
[Inst. Mar. Res., Bergen, Norway]

83-001674 Gusar, A. G.; V. A. Getmantsev and A. G. Semenov. THE ECOLOGY OF THE BLACK SEA WHITING, *MERLANGIUS MERLANGUS EUXINUS* (GADIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(4):157-160. 1982. SFA 28(3)
[IEMEZH, Moscow, USSR]

83-001675 Hansen, L. P. and T. B. Lea. TAGGING AND RELEASE OF ATLANTIC SALMON SMOLTS (*SALMO SALAR* L.) IN THE RIVER RANA, NORTHERN NORWAY. *Inst. Freshwater Res. Drottningholm Rep.* No. 60. p. 31-38. 1982. SFA 28(3)
[Dir. Wildl. Freshwater Fish, Fish Res. Div., P.O. Box 63, N-1432 Ås-NLH, Norway] From 1970 to 1974 a total of 18,592 one- and two-years-old reared smolts were tagged with Carlin tags and released in different parts of the River Rana, Northern Norway. Releases in the upper parts of the river yielded lower recapture rates than releases in the lower parts. Two-years-old smolts tend to mature at an earlier sea age than one-year-old smolts. But it was impossible to estimate the impact of genetic differences between the two groups, and different responses to environmental factors during the sea period. Recaptures were reported from large areas of the Norwegian sea and the Norwegian coast. 13.5% of the recaptures, however, were reported from the River Rana. Straying to other rivers was common, 17.6% of the river recaptures were reported from nearby rivers. Taking into account tagging mortality and nonreported tags, some of the experiments were considered to be profitable. This was not the case when considering the river recaptures alone.

83-001676 Jellyman, D. J. and C. M. Ryan. SEASONAL MIGRATION OF ELVERS (*ANGUILLA* SPP.) INTO LAKE POUNUI, NEW ZEALAND, 1974-1978. *N.Z. J. Mar. Freshwater Res.* 17(2):1-15. 1983. SFA 28(3)
[Fish. Res. Div., Minist. Agric. Fish., Private Bag, Christchurch, New Zealand] The migration of elvers of *Anguilla australis* Richardson and *A. dieffenbachii* Gray into Lake Pounui, Wairarapa, was monitored from November 1974 to July 1978 by installing a trap on the outlet stream. The trap was cleared regularly - daily from November 1976 to March 1977 - to provide data for a migration periodicity model. The number of elvers caught each season (August-July) varied from 6754 to 190 009, the largest migrations coinciding with the greatest seasonal rainfall and the smallest migrations with the least rainfall. *A. australis* dominated all samples: 99.4% of all

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

83-001676 CONTINUED elvers (N = 372 082) were this species. Glass-eels (Age Class 0) and Age Class 1 elvers predominated, although relative age class strengths varied considerably between seasons. Most elver activity occurred at dusk and dawn, but movement in daylight was observed during large migrations. Of various meteorological variables considered as possible influences on migration, water level was the most important and affected both periodicity and size of the migration. A delay of several days occurred between the peak water level of flood and the peak of the follwing migration; for the mathematical model a delay of 5 days was the most appropriate to explain variations. The water temperature and number of elvers on the preceding day was also incorporated into the final model, which accounted for 76% of the error sum of squares. To test the predictability of the model, daily values for water level, water temperature, and the number of elvers for Day 1 were supplied. The resulting series was in good agreement with both the observed and the calculated number of elvers.

83-001677 Kawamura, H.; K. Watanabe and M. Miyamoto. [TAGGING LIVERATION OF FRY FROM ADULT CHUM SALMON CAPTURED IN THE EASTERN HIDAKA COASTAL SEA--I. RETURNS OF THREE- AND FOUR-YEAR-OLD ADULTS IN 1977 YEAR CLASS.] *Sci. Rep. Hokkaido Fish Hatchery* No. 37. p. 13-21. Dec. 1982. In Japanese with English summ. SFA 28(3)

[Hokkaido Fish Hatchery, Nakanoshima, Toyohira-ku, Sapporo, Hokkaido, Japan]

83-001678 Loeng, H.; O. Nakken and A. Raknes. LODDAS UTBREDELSE I BARENTSHAVET I FORHOLD TIL TEMPERATURFELTET I PERIODEN 1974-1982. [THE DISTRIBUTION OF CAPELIN IN THE BARENTS SEA IN RELATION TO THE WATER TEMPERATURE IN THE PERIOD 1974-1982.] *Fisken Havet* 1983(1):1-17. 1983. In Norwegian with English summ. SFA 28(3)

[Inst. Mar. Res., Bergen, Norway]

83-001679 McKibben, J. N. A TELEMETRIC STUDY OF THE MOVEMENTS OF GRAY REEF SHARKS, *CARCHARHINUS AMBLYRHYNCHOS*, AT ENEWETAK ATOLL, MARSHALL ISLANDS. *M.S. thesis, Calif. State Univ. (Long Beach)* 165p. 1982. From Masters Abstr. 21(2):124. 1983. SFA 28(3) Thirty-one gray reef sharks were tagged and tracked with ultrasonic transmitters at Enewetak Atoll, Marshall Islands. Of these, 26 were multi-day trackings (intermittent) with durations of 2-23 days ($\bar{x}$=3.5±0.7 S.E.M. days). Various transmitter configurations were used including: simple pingers, distance measuring (Timefis and Transponding), and depth sensing. Three attachment methods were evaluated: 1) dorsal-fin mount, 2) body-cavity insertion, 3) self-ingestion in bait. Observed activity spaces of the sharks ranged in area from 0.19 km^2 to 53 km^2 ($\bar{x}$ =4.2±2.2 km^2) and in length from 300 m to 16 km ($\bar{x}$=3.6±0.7 km). Movement patterns suggested two behaviour modes: 1) sharks tagged near the ocean reefs were generally nomadic, moving relativly long distances along the reefs, and 2) sharks tagged on lagoon reefs or pinnacles had a more home-ranging pattern with different day and night areas, often returning day-after-day to the tagging site. In lagoon sharks, rates of movement increased significantly at night.

83-001680 Mundahl, N. and C. G. Ingersoll. EARLY AUTUMN MOVEMENTS AND DENSITIES OF JOHNNY (*ETHEOSTOMA NIGRUM*) AND FANTAIL (*E. FLABELLARE*) DARTERS IN A SOUTHWESTERN OHIO STREAM. *Ohio J. Sci.* 83(3):103-108. June 1983. SFA 28(3)

[Dep. Zool., Miami Univ., Oxford, OH 45056] Early autumn movements of johnny (*Etheostoma nigrum*) and fantail (*E. flabellare*) darters were

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

83-001680 CONTINUED examined in a pool-riffle system. Of the 340 johnny darters marked during the study, only 3.2% (10) of recaptured fish (N=309) moved. Three hundred and forty-one fantail darters were marked, and 12.78% (17) of recaptured fish (N=133) moved. Over 75% of all movements were restricted to areas near the point initial capture. Density estimates of the pool-dwelling johnny darter (0.80/m^2) were lower than those of the riffle-dwelling fantail darter (5.59/m^2). These results suggest that population density and habitat quality may influence the seasonal movements of stream fishes.

83-001681 Pollock, B. R.; H. Weng. and R. M. Morton. THE SEASONAL OCCURRENCE OF POSTLARVAL STAGES OF YELLOWFIN BREAM, *ACANTHOPAGRUS AUSTRALIS* (GÜNTHER), AND SOME FACTORS AFFECTING THEIR MOVEMENT INTO AN ESTUARY. *J. Fish Biol.* 22(4):409-415. Apr. 1983. SFA 28(3)
[Fish. Res. Br., Dep. Primary Indus., Brisbane, Queensland, Australia]

83-001682 Starnes, L. B.; P. A. Hackney and T. A. McDonough. LARVAL FISH TRANSPORT: A CASE STUDY OF WHITE BASS. *Trans. Am. Fish. Soc.* 112(3):390-397. May 1983. SFA 28(3)
[Div. Water Resour., TVA, Knoxville, TN 37902]

83-001683 Westerberg, H. ULTRASONIC TRACKING OF ATLANTIC SALMON (*SALMO SALAR* L.) - II. SWIMMING DEPTH AND TEMPERATURE STRATIFICATION. *Inst. Freshwater Res. Drottningholm Rep.* No. 60. p. 102-117. 1982. SFA 28(3)
[Dep. Oceanogr., Univ. Gothenburg, P.O. Box 4038, S-400 40 Gothenburg, Sweden] The swimming depth of 8 adult salmon was monitored continuously during tracking in the coastal zone at the time of spawning migration. A new depth-sensitive transmitter was used and is described. A technique for continuous recording and automatic decoding of the swimming depth data is presented. A behaviour common to all individuals were occasional rapid excursions down to the main thermocline, or, if the initial swimming depth was in the stratification, upwards to the mixed layer. The amplitude of the dives was 5 to 15 m, and seemed related to the distance to the thermocline. The vertical velocities of the dives was of the order of magnitude 0.1 m/s. The detailed vertical temperature distribution along the trajectory was recorded. A comparison of the temperature field and the swimming depth indicated that the salmon tended to follow finestructure gradient layers in the quasi-mixed surface layer or in the thermocline. These observations are interpreted using a model for olfactive orientation, where the salmon uses information found in the vertical to choose horizontal direction. The dives are seen as exploratory searches of the vertical distribution of a home stream odour. By choosing the finestructure gradient layer with the maximum concentration difference and then orientating against the direction of the local shear, the salmon has a strategy which would lead towards the origin of the olfactant. Measurements which indicate a slightly elevated body temperature in salmon, and some faculty of thermoregulation, are discussed.

FOODS/FEEDING

83-001684 Alexander, S. K. SUMMER DIET OF FINFISH FROM NEARSHORE HABITATS OF WEST BAY, TEXAS. *Tex. J. Sci.* 35(1):93-95. Mar. 1983. SFA 28(3)
[Dep. Mar. Biol., Tex. A&M Univ., Galveston 77553]

FOODS/FEEDING (CONTINUED)

83-001685 Andersen, K. P. AN INTERPRETATION OF THE STOMACH CONTENTS OF FISH IN RELATION TO PREY ABUNDANCE. *Dana* 2:1-50. 1982. SFA 28(3)
[Danish Inst. Fish. Mar. Res., Charlottenlund Castle, DK-2920 Charlottenlund, Denmark]

83-001686 Bengtson, D. A. RESOURCE PARTITIONING BY *MENIDIA MENIDIA* (L.) AND *MENIDIA BERYLLINA* (COPE) IN TWO RHODE ISLAND ESTUARIES. *Ph.D. dissertation, Univ. R.I.* 243p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(11):3501. May 1983. SFA 28(3)

83-001687 Bergstrand, E. THE DIET OF FOUR SYMPATRIC WHITEFISH SPECIES IN LAKE PARKIJAURE. *Inst. Freshwater Res. Drottningholm Rep.* No. 60. p. 5-14. 1982. SFA 28(3)
[Inst. Freshwater Res., S-170 11 Drottningholm, Sweden] Six basic whitefish populations are responsible for the present abundance of whitefish demes in Scandinavia. Four of them live sympatrically in Lake Parkijaure. Their vernacular names are large sparsely rakered whitefish ('storsik'), lesser sparsely rakered whitefish ('sandsik'), southern densely rakered whitefish ('planktonsik') and northern densely rakered whitefish ('aspsik'). Their number of gill rakers, growth rates and habitats were different and the sparsely rakered storsik and sandsik had a benthic diet, while the densely rakered planktonsik and aspsik were plankton feeders. The benthic diet of storsik and sandsik was similar, but their size-biased predation was different. The smaller sizes of storsik fed on larger benthic prey than sandsik, while sandsik was flexible in diet and fed partly on plankton. The plankton diet of small sandsik was similar to the diet of planktonsik and aspsik, with the exclusion of calanoid copepods which were absent, suggesting that sandsik is a less skilled plankton hunter than the two planktophagous species. Aspsik performed vertical movements and shared the habitat of the benthic whitefish, although its diet was planktonic completed with surface food. The small planktonsik lived in midwater, feeding exclusively on zooplankton. Five years after Lake Parkijaure was converted into a reservoir, positive effects of the damming-up phase such as better growth still obtained. The balance within the whitefish species group was as yet unaffected. The process of reduction of the benthic fauna has started, however, and the diet of the two benthic species was concentrated to few and smaller food items. Their feeding niches overlapped more than previously. The diet of the plankton feeders was not affected. The catches of all four species was lower.

83-001688 Buynak, G. L.; A. J. Gurzynski and H. W. Mohr, Jr. COMPARISON OF THE FOOD HABITS OF SMALLMOUTH BASS (*MICROPTERUS DOLOMIEUI*) AT TWO STATIONS ON THE SUSQUEHANNA RIVER. *Proc. Pa. Acad. Sci.* 56(2):127-132. 1982. SFA 28(3)
[Ichthyological Assoc., Inc., R.D. 1, Berwick, PA 18603] Food habits of smallmouth bass (*Micropterus dolomieui*) collected from the Susquehanna River at two stations were studied. Numerous differences were found in the food habits of the five different age groups collected. Near the Susquehanna Steam Electric Station (SSES), small fish were the most important forage consumed by age 0+ bass. Fish were relatively unimportant in the diets of age 0+ smallmouth bass collected at Falls, where mayflies and caddisflies were more important. In older smallmouth bass, crayfish and fish composed the bulk of their diets. The importance of these organisms in the diets of smallmouth bass and the species of fish consumed, differed at the two stations. Margined madtom (*Noturus insignis*) was an important forage species at Falls, where few shiners (*Notropis* sp.) were identified in stomach samples. No madtoms were found in the stomach of smallmouth bass at SSES. At SSES, shiners were the dominate forage fish. The degree of

FOODS/FEEDING (CONTINUED)

83-001688 CONTINUED utilization of crayfish at the two stations also differed. At Falls, the importance of crayfish decreased as the smallmouth bass became older, while at SSES, their importance increased to where crayfish were almost eaten exclusively by older smallmouth. The differences in the food habits of smallmouth bass at the two stations can be attributed not only to the abundance of the forage organisms, but also to their vulnerability to predation by smallmouth bass.

83-001689 Clements, W. H. and R. J. Livingston. OVERLAP AND POLLUTION-INDUCED VARIABILITY IN THE FEEDING HABITS OF FILEFISH (PISCES: MONACANTHIDAE) FROM APALACHEE BAY, FLORIDA. *Copeia* 1983(2):331-338. 6 May 1983. SFA 28(3)

[Dep. Biol. Sci., Fla. State Univ., Tallahassee 32306] The distribution and feeding habits of two species of filefish, *Monacanthus ciliatus* and *Stephanolepis hispidus*, were examined. Spatial and temporal distribution and feeding habits of the two species overlapped broadly. The apparent similarity in diet was reduced when prey were identified to species. Analysis of ontogenetic variation of each species indicated a tendency toward herbivory with increasing standard length. The feeding habits of *M. ciliatus* taken from areas affected by pulp mill effluents were compared to those from a nearby unpolluted estuary. Cluster analysis of stations within the two systems, based on feeding habits of *M. ciliatus*, were similar to those based on numbers of fishes and macrophyte biomass. Differences in the feeding habits between the two systems may be due to pollution-induced habitat modifications and resulting changes in prey distribution.

83-001690 Cyrus, D. P. and S. J. M. Blaber. THE FOOD AND FEEDING ECOLOGY OF GERREIDAE, BLEEKER 1859, IN THE ESTUARIES OF NATAL. *J. Fish Biol.* 22(4):373-393. Apr. 1983. SFA 28(3)

[Dep. Zool., Univ. Natal, Pietermaritzburg, Natal, South Africa]

83-001691 de Iongh, H. H.; P. C. Spliethoff and V. G. Frank. FEEDING HABITS OF THE CLUPEID *LIMNOTHRISSA MIODON* (BOULENGER), IN LAKE KIVU. *Hydrobiologia* 102(2):113-122. 3 June 1983. SFA 28(3)

[Organ. Improvement Inland Fish., Buxtehudelaan 1, 3438 EA Nieuwegein, Netherlands]

83-001692 Deacutis, C. F. FEEDING BEHAVIOR OF RED HAKE AND TAUTOG, AND RESPONSES TO OIL-TAINTED FOOD. *Ph.D. dissertation, Univ. R.I.* 196p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(11):3447. May 1983. SFA 28(3)

Sensory reliance and search accuracy during feeding behavior were quantified for two teleosts; the red hake (*Urophysis chuss*), and the tautog (*Tautoga onitis*). Both species exhibited arousal responses to a solitary chemical food stimulus, but red hake demonstrated greater chemosensory localization accuracy of the cue source. Tautog did not appear to localize the cue source, but showed increased responsiveness towards detritus and other visual stimuli. Tautog responded to a solitary visual stimulus with attempted ingestion, while hake ignored this cue and decreased activity. Results of these and other behavioral tests demonstrated that the red hake, under these experimental conditions, showed greatest responses towards chemical food stimuli, while tautog responded mainly to visual stimuli. Later studies examined the roles of the two chemosensory systems of red hake (olfaction and external taste) during food search. Sensory-deprived hake were tested for arousal and search localization behaviours in a near-laminar flow tank with a chemical food stimulus. Hake were capable of

FOODS/FEEDING (CONTINUED)

83-001692 CONTINUED detecting and localizing a chemical stimulus source with either chemosensory system alone. The results of behavioral investigations were complemented by examination of external brain morphology and a scanning electron microscopic study of the olfactory receptors of both species. The brain morphology and olfactory receptor ultra-structure of the red hake were indicative of species which is highly oriented towards chemical stimuli. External brain morphology and olfactory structure of the tautog correlated well with a categorization of these species as visually-oriented. A second study was designed to examine the response of these two species to food tainted with No. 2 fuel oil, and to determine whether such responses were related to sensory reliance. Results of behavioral studies indicated that neither species would significantly alter feeding responses towards normal prey contaminated with petroleum, but would increase rejection of less-preferred prey items following oil contamination. Intake of contaminated prey may increase the potential for food web transfer of undesirable metabolites, and may increase susceptibility to disease in localized fish populations.

83-001693 Galat, D. and N. Vucinich. FOOD OF LARVAL TUI CHUBS, *GILA BICOLOR*, IN PYRAMID LAKE, NEVADA. *Great Basin Nat.* $#(1):175-178. 31 Jan. 1983. SFA 28(3)

[Coop. Fish. Res. Unit, Colo. State Univ., Fort Collins, CO 80523] Four near-surface locations in Pyramid Lake, Nevada, were sampled for larval tui chubs (*Gila bicolor*) during summer and early fall 1979. Numbers of larvae collected were highest in mid-July. Zooplankton was the only food eaten throughout the survey; the cladoceran *Moina hutchinsoni* was the major species eaten at all locations. An other cladoceran, *Diaphanosoma leuchtenbergianum*, was also important to the diet of pelagic larvae, and the copepod *Cyclops vernalis* was eaten in significant quantities by nearshore fish. Changes in diet composition of larval tui chubs during summer corresponded to seasonal succession of zooplankton species in Pyramid Lake.

83-001694 Gardinier, M. N. and T. B. Hoff. DIET OF STRIPED BASS IN THE HUDSON RIVER ESTUARY. *N.Y. Fish Game J.* 29(2):152-165. July 1982. SFA 28(3)

[Texas Instruments, Inc., Buchanan, NY 10511] Striped bass were collected from the Hudson River estuary by beach seine and bottem trawl from April to November in 1974 and with a haul seine during April and May in 1976 and 1977. The stomach contents for those taken in 1974 were analyzed according to four length groups. Striped bass less than 200 millimeters in total length fed on small invertebrates primarily, but took some fish. Larger individuals were almost totally piscivorous, consuming the young of such species as blueback herring, Atlantic tomcod, bay anchovy, white perch, banded killifish and mummichog. Striped bass collected just prior to and during the spawning season in 1976 and 1977 had fed, but only 27 per cent of the stomachs examined contained food and no canibalism was observed. Few specimens more than 200 millimeters in total length that were collected at this time had taken invertebrates. A higher proportion of the stomachs of mature bass contained fish and a lower proportion invertebrates than was the case for immature bass. There was no apparent long-term (several weeks) cessation of feeding associated with spawning.

83-001695 Hamrin, S. THE FOOD PREFERENCE OF VENDACE (*COREGONUS ALBULA*) IN SOUTH SWEDISH FOREST LAKES INCLUDING THE PREDATION EFFECT ON ZOOPLANKTON POPULATIONS. *Hydrobiologia* 101(1-2):121-128. 22 Apr. 1983. SFA 28(3)

[Inst. Limnol., Univ. Lund, Box 3060, S-220 03 Lund, Sweden] Vendace (*Coregonus albula, L.*) is in the southern part of its distribution area during the summer period restricted to hypolimnion. Food is dominated by

FOODS/FEEDING (CONTINUED)

83-001695 CONTINUED *Bosmina coregoni* and *Daphnia* sp. The selectivity index is highest for large cladocerans and large copepods. The pelagic crustacean fauna in vendace lakes is dominated by small species like *Bosmina coregoni*, *Daphna cristata*, *Thermocyclops* and *Mesocyclops* sp. and *Eudiaptomus* sp. During periods of maximum vendace abundance only *Bosmina coregoni* is left of the cladocerans, while the abundance of cyclopoid copepods increases.

83-001696 Hartmann, J. TWO FEEDING STRATEGIES OF YOUNG FISHES. *Arch. Hydrobiol.* 96(4):496-509. 1983. SFA 28(3)

[Inst. Seenforsch. Fischerewesen, D-7994 Langenargen, West Germany] The gut contents of young fishes of four taxa of Lake Constance have been studied with regard to ontogenetic trends of particle sizes and particle numbers/gut. Two feeding strategies have been observed pointing at binary food composition and an alternate increase of mean size and number of particles/gut. According to the gut contents three ontogenetic stages have been distinguished. The transition from stage I to II goes along with morphological changes. Limiting factors in succession of the three phases are supposed to be skill, mouth size, and size of available food organisms. The two strategies described may work towards simplification of search images, balanced diet, continuity and stability of food supply.

83-001697 Henderson, M. A. AN ANALYSIS OF PREY DETECTION IN CUTTHROAT TROUT (*SALMO CLARKI CLARKI*) AND DOLLY VARDEN CHARR (*SALVELINUS MALMA*). *Ph.D. dissertation, Univ. British Columbia* 1982. From Diss. Abstr. Int. B Sci. Eng. 43(12):3878. June 1983. SFA 28(3)

83-001698 Jensen, J. W. A CHECK ON THE INVERTEBRATES OF A NORWEGIAN HYDROELECTRIC RESERVOIR AND THEIR BEARING UPON FISH PRODUCTION. *Inst. Freshwater Res. Drottningholm Rep.* No. 60. p. 39-50. 1982. SFA 28(3)

[Univ. Trondheim, Royal Norwegian Soc. Sci. Lett., Museum, Erling Skakkes gt. 47 B, N-7000 Trondheim, Norway] The 36.7 km^2 Aursjöen reservoir has been regulated since 1953, and includes a main basin regulated 28 m and the Gautsjöen basin regulated 5 m. Brown trout (*Salmo trutta* L.) and grayling (*Thymallus thymallus* L.) are the only fishes present. The crustacean plankton seemed unaffected by the water fluctuations. The soft bottom and littoral fauna was dominated by Oligochaeta, Chironomidae, *Pisidium*, and the Cladocera *Eurycercus lamellatus*. Besides small numbers of Hydracarina and unidentified Diptera, 6 species of other insects, and 8 species of littoral Entomostraca were recorded. The material identified to the species level revealed only minor qualitative differences between the two basins. The biomass of benthos, mainly Chironomidae, in the Gautsjöen basin was several times higher than before regulation started. The basis of this high production of Chironomidae has to be the peat deposits of the impounded, boggy ground. Based on the biomass data and probable figures of the P/B relations, the estimated production of planktonic food organisms for fish exceeded the corresponding benthos with a factor of 140 for the main, and 5 for Gautsjöen basin. Stocking with a plankton-consuming fish, for example Arctic char, *Salvelinus alpinus* (L.), would probably tenfold the yield of fish.

83-001699 Kirby, J. M. PREY UTILIZATION AMONG FOUR SYMPATRIC SPECIES OF SUNFISH. *Proc. Pa. Acad. Sci.* 56(2):147-150. 1982. SFA 28(3)

[Biol. Dep., Mansfield State Coll., Mansfield, PA 16933] The feeding habits of four species of sunfish (*Lepomis auritus*, *L. gibbosus*, *L. macrochirus*, and *L. cyanellus*) were investigated in the Schylkill River of eastern Pennsylvania. The purpose of this study was to examine the degree of dietary

FOODS/FEEDING (CONTINUED)

83-001699 CONTINUED overlap among four sympatric sunfish congeners. Food resource utilization was determined by examining stomach contents and analyzing the differential selection of available prey. Sunfish diets of invertebrates were compared using a percent similarity index and Horn's Coefficient of Dietary Overlap. Dietary analysis indicated extensive overlaps in prey utilization among these four sunfish. Diet overlaps occurred during the late spring to early autumn and were related to the general abundance of specific dipteran prey organisms. These data suggest that sympatry of cogeneric sunfish species may not result in extensive diet divergence.

83-001700 Kocher, T. D. and K. R. McKaye. DEFENSE OF HETEROSPECIFIC CICHLIDS BY *CYRTOCARA MOORII* IN LAKE MALAWI, AFRICA. *Copeia* 1983(2):544-547. 6 May 1983. SFA 28(3)
[Dep. Environ. Popul. Organ. Biol., Univ. Colo., Boulder 80309]

83-001701 Konchina, Y. V. FEEDING OF THE PACIFIC MACKEREL, *SCOMBER JAPONICUS* (SCOMBRIDAE), NEAR THE PERUVIAN COAST. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(6):102-111. 1982. SFA 28(3)
[VNIRO, Moscow, USSR]

83-001702 Lipskaya, N. Y. THE FEEDING OF LARVAE OF THE CHUB MACKEREL, *SCOMBER JAPONICUS* (SCOMBRIDAE), FROM THE SOUTHEASTERN PACIFIC. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(4):97-104. 1982. SFA 28(3)
[VNIRO, Moscow, USSR] Characteristics of the feeding of larvae of the chub mackeral, *Scomber japonicus*, in the region of the southeastern Pacific Ocean (SEPO) were studied. Against a background of qualitative diversity and quantitative abundance of food, the larvae did not feed very intensively and the food spectrum was very narrow. Cannibalism was noted; this was particularly distinctly manifested in the spawning grounds where newly hatched larvae and older juveniles occur together.

83-001703 Macdonald, J. S. and R. H. Green. REDUNDANCY OF VARIABLES USED TO DESCRIBE IMPORTANCE OF PREY SPECIES IN FISH DIETS. *Can. J. Fish. Aquatic Sci.* 40(5):635-637. May 1983. In English with French summ. SFA 28(3)
[Dep. Fish. Oceans, West Vancouver Lab., 4160 Marine Dr., West Vancouver, BC V7V 1N6, Canada]

83-001704 Magurran, A. E. and T. J. Pitcher. FORAGING, TIMIDITY AND SHOAL SIZE IN MINNOWS AND GOLDFISH. *Behav. Ecol. Sociobiol.* 12(2):147-152. May 1983. SFA 28(3)
[Sch. Anim. Biol., Univ. Coll. North Wales, Bangor, Gwynedd LL57 2YW, Wales] The behaviour of individual minnows (*Phoxinus phoxinus*) and goldfish (*Carassius auratus*) foraging on an artificial food patch was recorded for single species shoals of 2, 4, 6, 12 and 20 fish. In both species shoal size accounted for most variation in behaviour in the experiments. The behaviour of individual goldfish differed more than that of individual minnows, a result that can be explained by the weaker shoaling tendency of goldfish. 'Timid' behaviour, for example lurking in the weeds or rapid darting and turning, predominated in small shoals. It was only in large shoals that fish made frequent and lengthy visits to the patch.

83-001705 Manooch, C. S. III and W. T. Hogarth. STOMACH CONTENTS AND GIANT TREMATODES FROM WAHOO, *ACANTHOCYBIUM SOLANDERI*, COLLECTED ALONG THE SOUTH ATLANTIC AND GULF COASTS OF THE UNITED STATES. *Bull. Mar. Sci.*

FOODS/FEEDING (CONTINUED)

83-001705 CONTINUED 33(2):227-238. Apr. 1983. SFA 28(3)
[NMFS, Southeast Fish. Cent., Beaufort, NC 28516-9722] Stomachs of 885 wahoo, *Acanthocybium solanderi*, collected along the southeastern Atlantic and Gulf of Mexico coasts of the United States from 1965-1981 were examined for food contents and parasites. Approximately 53% of the stomachs contained food consisting primarily of pelagic fishes and squids. Frigate and mackerel, *Auxis thazard*, porcupinefish, *Diodon hystrix*, and flyingfish, *Cypselurus* sp., occurred most frequently. There were only slight differences between the diets of wahoo collected from the Gulf of Mexico and from the southeastern United States. Unlike several sympatric species, wahoo did not eat small items, nor did they feed as readily at the surface. No relationship was found between the size of wahoo and the size of prey. Giant digenetic trematodes, tentatively identified as *Hirudinella ventricosa*, were found in 80.5% of the stomachs ($\bar{x}$ = 2 parasites/fish). Size and sex of the host had no significant effect on parasitic infestation; geographical area of collection did.

83-001706 O'Grady, M. F. OBSERVATIONS ON THE DIETARY HABITS OF WILD AND STOCKED BROWN TROUT, *SALMO TRUTTA* L., IN IRISH LAKES. *J. Fish Biol.* 22(5):593-601. May 1983. SFA 28(3)
[Cent. Fish. Bd., Mobhi Boreen, Glasnevin, Dublin 9, Ireland] The dietary habits and feeding rates of wild and stocked brown trout were compared for populations in a number of Irish lakes. Wild trout and stocked fish, which had been present in a fishery for 12 months or longer, tend to feed on the same dietary items at similar rates. Stocked fish in their immediate post-planting period (1-14 days) ate less than both the wild trout and established planted fish. In some intances recently stocked fish appear to have a preference for surface food items. They also consumed stones and detritic material. Data indicate that stocked fish adopted a natural diet in less than 5 months. Results are discussed in relation to angling crops of wild and stocked fish and the comparative success of autumn and spring plantings of salmonids.

83-001707 Scholl, J. P. SKULL FRAGMENTS OF THE CALIFORNIA SEA LION *(ZALOPHUS CALIFORNIANUS)* IN STOMACH OF A WHITE SHARK *(CARCHARODON CARCHARIAS)*. *J. Mammal.* 64(2):332. May 1983. SFA 28(3)
[Dep. Fish Game, 350 Golden Shore, Long Beach, CA 90802]

83-001708 Shireman, J. V.; R. W. Rottmann and F. J. Aldridge. CONSUMPTION AND GROWTH OF HYBRID GRASS CARP FED FOUR VEGETATION DIETS AND TROUT CHOW IN CIRCULAR TANKS. *J. Fish Biol.* 22(6):685-693. June 1983. SFA 28(3)
[Cent. Aquatic Weeds, Univ. Fla., Gainesville 32611] Grass carp, *Ctenopharyngodon idella*, and hybrid grass carp (grass carp ♀ X bighead carp ♂, *Aristichthys nobilis*), were fed duckweed (*Lemna* sp.), hydrilla (*Hydrilla verticillata*), chara (*Chara* sp.), filamentous algae (*Odogonium* sp., *Spirogyra* sp.), and trout chow. Grass carp consumed all plants in greater amounts than hybrids. Grass carp grew best when fed hydrilla and trout chow and showed positive growth on all diest. Hybrids grew equal to grass carp when fed trout chew but did not grow on the vegetation diets. Low consumption rates of aquatic plants may indicate that hybrids are questionable as a plant biocontrol agent.

83-001709 Usmanova, R. G. VARIABILITY OF CHARACTERS AND SOME ASPECTS OF THE BIOLOGY OF YOUNG SNAKEHEAD, *OPHICEPHALUS ARGUS WARPACHOWSKII* (OPHICEPHALIDAE), IN THE KASHKADAR'YA BASIN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(6):86-90. 1982. SFA 28(3)
[Karshi State Educ. Inst., Karshi, Uzbek, USSR]

FOODS/FEEDING (CONTINUED)

83-001710 Van Den Avyle, M. J.; B. J. Higginbotham; B. T. James and F. J. Bulow. HABITAT PREFERENCES AND FOOD HABITS OF YOUNG-OF-THE-YEAR STRIPED BASS, WHITE BASS, AND YELLOW BASS IN WATTS BAR RESERVOIR, TENNESSEE. *N. Am. J. Fish. Manage.* 3(2):163-170. 1983. SFA 28(3)
[Ga. Coop. Fish. Res. Unit, Univ. Ga., Athens 30602]

83-001711 Vdovin, A. N. and V. P. Vasil'kov. AGE DETERMINATION IN ASIAN GREENLING, *PLEUROGRAMMUS AZONUS* (HEXAGRAMMIDAE), BY THE ALGORITHMIC METHODS OF IDENTIFICATION OF OBJECTS. *J. Ichthyol. (Engl. Trans. Vopr. Ikhtiol.)* 22(6):112-120. 1982. SFA 28(3)
[TINRO, Vladivostok, USSR] Results on application of algorithm of the potential functions, with subsequent optimization on the basis of error, for age determination are presented. The classification was done on the basis of the age-related characters of scales, their annuli, circuli, and radius, recorded and measured photometrically (Goncharov and Smetanin, 1974), and the biological parameters of body length and weight. A total of the ten characters were used. The resolution of different characters changes with age:scale radius and body length are best in the young, and body weight and number of annuli on the scales in the old fishes. The initial algorithms for age estimation based on the scale characters gave a 30% error, and optimization on the basis of the aggregate characters resulted in a 7% error.

83-001712 Viljanen, M. FOOD AND FOOD SELECTION OF CISCO (*COREGONUS ALBULA L.*) IN A DYSOLIGOTROPHIC LAKE. *Hydrobiologia* 101(1-2):129-138. 22 Apr. 1983. SFA 28(3)
[Karelian Inst., Sect. Ecol., Univ. Joensuu, Box 111, 80101 Joensuu 10, Finland] With minor exceptions, cisco (*C. albula*) in Lake Suomunjärvi fed on cladocerans and copepods. The food habits were different among two size classes of fish. The composition of cisco diet changed at different depths and times of the day, but the distribution of zooplankton was usually very similar in each period irrespective of the depth or diel period. *Daphnia, Bosmina, Cyclops scutifer* and *Heterocope appendiculata* were the main diet of cisco. Calculations of fish electivity indices showed that cisco selected usually large species of cladocerans and copepods and a small cladoceran, *Bosmina coregoni*. Body-size selection was clear for *Daphnia* and *Bosmina*.

83-001713 Whitaker, J. O., Jr. FOOD HABITS OF THE BRINDLED MADTOM, *NOTURUS MINURUS* JORDAN, AND THE REDFIN SHINER, *NOTROPIS UMBRATILIS* GIRARD, FROM WEST CENTRAL INDIANA. *Proc. Indiana Acad. Sci.* 91:247-250. 1981(1982). SFA 28(3)
[Dep. Life Sci., Indiana State Univ., Terre Haute 47809]

AGE AND GROWTH

83-001714 Bimber, D. L. LONGEVITY, GROWTH AND MORTALITY OF MUSKELLUNGE IN CHAUTAUQUA LAKE, NEW YORK. *N.Y. Fish Game J.* 29(2):134-141. July 1982. SFA 28(3)
[Environ. Resour. Cent., Dep. Biol., State Univ. Coll., Fredonia, NY 14063] Growth and mortality rates of muskellunge in Chautauqua Lake were estimated from data collected during spring netting of broodstock from 1962 to 1977.

AGE AND GROWTH (CONTINUED)

83-001714 CONTINUED Females grew faster and had a higher survival than males. Females usually reached repoductive maturity in their fifth spring at a mean length of 77 centimeters. Most males matured by age 4 at a mean length of 67 centimeters. Growth differences between hatchery and native stocks were not significant. Mean condition factors (K) for spawning fish were 0.641 for females and 0.584 for males. Adult muskellunge exhibited a length-weight relationship of log W = -6.70 + 3.51 log TL. Pooled data from seven year classes (1961-1967) indicated survival rates of 0.85 and 0.69 for females and males, respectively.

83-001715 Busch, W. N. and J. W. Heinrich. GROWTH AND MATURITY OF WHITE PERCH IN LAKE ONTARIO. *N.Y. Fish Game J.* 29(2):206-208. July 1982. SFA 28(3)
[U.S. FWS, Great Lakes Fish. Lab., Harrisburg, PA 17101]

83-001716 Cass, A. J. and R. J. Beamish. FIRST EVIDENCE OF VALIDITY OF THE FIN-RAY METHOD OF AGE DETERMINATION FOR MARINE FISHES. *N. Am. J. Fish. Manage.* 3(2):182-188. 1982. SFA 28(3)
[Dep. Fish. Oceans, Pac. Biol. Stn., Naniamo, BC V9R 5K6, Canada]

83-001717 Coutant, C. C. and D. L. DeAngelis. COMPARATIVE TEMPERATURE-DEPENDENT GROWTH RATES OF LARGEMOUTH AND SMALLMOUTH BASS FRY. *Trans. Am. Fish. Soc.* 112(3):416-423. May 1983. SFA 28(3)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

83-001718 Erickson, C. M. AGE DETERMINATION OF MANITOBAN WALLEYES USING OTOLITHS, DORSAL SPINES, AND SCALES. *N. Am. J. Fish. Manage.* 3(2):176-181. 1983. SFA 28(3)
[Manitoba Dep. Nat. Resour., Fish. Br., Biol. Serv. Sect., P.O. Box 40, Winnipeg, MB R3H 0W9, Canada]

83-001719 Jobling, M. INFLUENCE OF BODY WEIGHT AND TEMPERATURE ON GROWTH RATES OF ARCTIC CHARR, *SALVELINUS ALPINUS* (L.). *J. Fish Biol.* 22(4):471-475. Apr. 1983. SFA 28(3)
[Inst. Fish., Univ. Tromso, Norway] When reared for a period of 6 months at a temperature of 10°C Arctic charr, *Salvelinus alpinus*, increased in weight from 18g to approximately 135g. Specific growth rates decreased as the fish increased in size and the relationship between size and growth rate could be described by the equation: $\log_e G_W = 1.722 - 0.325 \log_e W$ where G_W is specific growth rate and W is fish weight in grams. Temperature effects upon growth were examined using previously published data. Below the optimum growth temperature, the growth rate of a fish of given size could be predicted using the equation: $\log_e G_W = \log_e [7.5(0.0219 + 0.0727\ T)] - 0.325 \log_e W$ where T is the rearing temperature. Rates of growth of Arctic charr were as high as those reported for other salmonid species reared under similar conditions. Preliminary results suggested that growth rates of charr may be lower in salt water than in fresh water.

83-001720 Kipling, C. CHANGES IN THE GROWTH OF PIKE (*ESOC LUCIUS*) IN WINDERMERE. *J. Anim. Ecol.* 52(2):647-657. June 1983. SFA 28(3)
[Freshwater Biol. Assoc., The Ferry House, Far Sawrey, Ambleside, Cumbria,

AGE AND GROWTH (CONTINUED)

83-001720 CONTINUED England] Pike (*Esox lucius* L.) were sampled in Windermere every year from 1944 to 1982. Lengths-for-age of 11775 fish were determined from the opercular bones. Ages ranged from 2 to 18 years. Pike aged 9 years and older formed 19% of the catch in 1944, 3%, 2% and 1% respectively in the 1950s, 1960s and 1970s. Three periods of different growth were identified: (a) the late 1940s and 1950s, (b) the early 1960s, (c) the late 1960s and 1970s. Comparison of mean lengths at ages 1-4 years, males and females separately of year-classes hatched in 1943, 1953, 1963 and 1973 showed at each age, (a) no significant differences between 1943 and 1953 year-classes, (b) 1963 year-class significantly smaller than the other year-classes (with one exception), (c) 1973 year-class significantly larger than the other year-classes. Growth was adequately described by von Bertalanffy's equation. Males had a smaller ultimate length than females, and their expected life-span was shorter. Regressions of weight of females at age 4 years on cumulative temperature (degree days over 14°C in the first 4 years of life) were: very significant for year-classes 1944-1978 and 1944-1959, and not significant for year-classes 1960-1065 and 1968-1978. The main food of pike is perch (*Perca fluviatilis* L.). In the late 1940s and 1950s the food supply was sufficient for pike to respond to changes in temperature conditions by changes in growth. In the early 1960s the food supply was insufficient, growth was poor and was not correlated with temperature conditions. In the late 1960s and 1970s, food supply for young pike became limited probably due to the fast growth of perch, and it is likely that cannibalism bacame intensified. There were low numbers and high mean values for length and weight of pike. Growth was good and was not correlated with temperature conditions. Prediction of pike gorwth in the 1960s and 1970s could not reasonably have been made on the basis of observed growth during the previous 20 years.

83-001721 Kuz'min, O. G. and Y. A. Smirnov. ENVIRONMENTAL FACTORS AND GROWTH OF YOUNG ATLANTIC SALMON, *SALMO SALAR* (SALMONIDAE), IN SMALL RIVERS OF THE KOLA PENNINSULA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(5):42-51. 1982. SFA 28(3)
[PINRO, Murmansk, USSR]

83-001722 Mosier, D. D. II and D. W. Willis. POPULATION STRUCTURE AND AGE AND GROWTH OF WHITE CRAPPIE IN THE HEADWATERS OF COW CREEK, KANSAS. *Prairie Nat.* 15(1):35-37. Mar. 1983. SFA 28(3)
[Biol. Dep., Pittsburg State Univ., Pittsburg, KS 66762]

83-001723 Rask, M. DIFFERENCES IN GROWTH OF PERCH (*PERCA FLUVIATILIS* L.) IN TWO SMALL FOREST LAKES. *Hydrobiologia.* 101(1-2):139-144. 22 Apr. 1983. SFA 28(3)
[Lammi Biol. Stn. Univ. Helsinki, SF-16900 Lammi, Finland] Growth patterns and food composition of perch, *Perca fluviatilis* L., was studied in two small forest lake populations in southern Finland. Size and morphometry of the lakes and physical and chemical properties of water are similar. There is a clear difference in the growth rates of perch between the two lakes. The difference in growth is highly significant in all age groups. In the first lake there is a perch population of 2000 (1750 ind·ha^{-1}) adult fishes. In the second lake there is a small population of pike, that keeps the perch population down: 200 adult perch (530 ind·ha^{-1}). The main food items of perch are crustacean zooplankton, *Asellus aquaticus* L. and Trichoptera larvae in the first lake and zooplankton, Odonata larvae, Ephemeroptera larvae and Heteroptera in the second. It is concluded that the main reason for the growth difference of studied perch populations is the different population density. There are also differences in species composition of bottom fauna of the lakes, maybe

AGE AND GROWTH (CONTINUED)

83-001723 CONTINUED owing to the floating Sphagnum peat moss vegetation in the second lake. This can also affect the growth difference between the two populations of perch.

83-001724 Smagula, C. M. and I. R. Adelman. GROWTH IN A NATURAL POPULATION OF LARGEMOUTH BASS, *MICROPTERUS SALMOIDES* LACEPEDE, AS DETERMINED BY PHYSICAL MEASUREMENTS AND [14C]-GLYCINE UPTAKE BY SCALES. *J. Fish Biol.* 22(6):695-703. June 1983. SFA 28(3)

[Dep. Entomol. Fish. Wildl., Univ. Minn., St. Paul 55108] Growth of largemouth bass, *Micropterus salmoides*, in Lake Rebecca, Minnesota began in July and was associated with increased food consumption. Decreased maintenance levels and increased food consumption combined to produce maximum growth in September. Body growth and *in vitro* [14C]-glycine uptake by scales varied similarly after the onset of growth; however, during the pre-growth period, fluctuations in glycine uptake may have reflected physiological changes that were not detected by measurement of scale and body growth, but did relate to feeding activity. Patterns of glycine uptake and scope for growth were positively correlated (r=0.74, $P<0.05$), which suggested that uptake may be related to general nutritional state.

83-001725 Tankevich, P. B. AGE AND GROWTH OF THE BIGEYED TUNA, *THUNNUS OBESUS* (SCOMBRIDAE) IN THE INDIAN OCEAN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(4):26-31. 1982. SFA 28(3)

[AzCherNIRO, Kerch, USSR] Maximum increments are observed in the first year of life of the bigeyed tuna, amounting to 59.0 cm. In subsequent years the rate of growth slows and in the fifth - sixth year the annual increment is 14.1 - 15.5 CM. The length and weight increase of females and males is similar to the 3rd - 4th year, after which a decrease in the rate of growth is observed in females. Tuna from the north-eastern region have a higher growth rate than tuna from other sections of the ocean. The bigeyed tuna is represented in long-line catches by specimens between 42 and 200 cm long weighing 1.3 to 124 kg; the age of the fish varied between 1 and 8 years with a predominance of 1st and 4th year fish.--Concl.

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

83-001726 Almeida, A. J. and M. Ibañez. AU SUJET DE LA CITATION DE *BLENNIUS ROUXI* COCCO, 1833 SUR LA CÔTE BASQUE. [CONCERNING THE CITATION OF *BLENNIUS ROUXI* COCCO, 1833 FROM THE BASQUE COAST.] *Arq. Mus. Bocage SEr. B* 1(4):37-40. 1981. In French with English summ. SFA 28(3)

[Mus. Bocage, Fac. Cienc., Lisbon, Portugal]

83-001727 Bauer, B. H.; G. R. Dinkins and D. A. Etnier. DISCOVERY OF *NOTURUS BAILEYI* AND *N. FLAVIPINNIS* IN CITICO CREEK, LITTLE TENNESSEE RIVER SYSTEM. *Copeia* 1983(2):558-560. 6 May 1983. SFA 28(3)

[Soil Systems, Inc., 525 Webb Industrial Dr., Marietta, GA 30062]

83-001728 Bekker, V. E.; T. N. Belyanina; N. I. Kashkin and K. N. Nesis. MESOPELAGIC FISH AND CEPHALOPODA FROM THE FOUR REGIONS OF THE NORTH ATLANTIC (FROM COLLECTIONS OF THE 31ST STUDY CRUISE OF THE RESEARCH VESSEL AKADEMIK KURCHATOV). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(4):19-25. 1982. SFA 28(3)

[IOAN, Moscow, USSR]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

83-001729 Beumer, J. P.; R. G. Pearson and L. K. Penridge. PACIFIC SHORT-FINNED EEL, *ANGUILLA OBSCURA* GUNTER, 1871 IN AUSTRALIA: RECENT RECORDS OF ITS DISTRIBUTION AND MAXIMUM SIZE. *Proc. R. Soc. Queensl.* 92:85-90. 24 Apr. 1981. SFA 28(3)
[Fish. Wildl. Div., Arthur Rylah Inst. Environ. Res., 123 Brown St., Heidelberg, Victoria, Australia]

83-001730 Blasco, M. and R. Muñoz-Chapuli. PRESENCIA DE *ALOPIAS SUPERCILLIOSUS* EN LAS COSTAS IBERICAS Y DATOS SOBRE SU MORFOLOGIA. [PRESENCE OF *ALOPIAS SUPERCILLIOSUS* ON THE IBERIAN COAST AND DATA ON MORPHOLOGY.] *Arq. Mus. Bocage Ser. B* 1(6):53-62. 1981. In Spanish with English summ. SFA 28(3)
[Mus. Zool. Antropol., Fac. Sci., Lisbon, Portugal]

83-001731 Carvalho, F. P. *CHLOROPHTALMUS AGASSIZI* BONAPARTE, 1840 (PISCES, CHLOROPHTALMIDAE): FAMILLE, GENRE ET ESPÈCE NOUVEAUX POUR LA FAUNE MARINE DU PORTUGAL. [*CHLOROPHTALMUS AGASSIZI* BONAPARTE, 1840 (PISCES, CHLOROPHTALMIDAE): FAMILY, GENUS AND SPECIES NEW FOR THE MARINE FAUNA OF PORTUGAL.] *Arq. Mus. Bocage Ser. B* 2(2):9-14. 1982. In French with English summ. SFA 28(3)
[Lab. Nac. Engen. Ternol., Indust. Dep. Port. Segur. Radiol., Estrada Nuc. 10, 2685 Sacaveni, Portugal]

83-001732 Christie, R. W. and T. A. Curtis. ESTABLISHMENT OF BLUEFIN KILLIFISH, *LUCANIA GOODEI*, IN COOPER RIVER, SOUTH CAROLINA. *Ga. J. Sci.* 41(3):91-92. June 1983. SFA 28(3)
[S.C. Wildl. Mar. Resour. Dep., P.O. Drawer 170, Bonneau 29431]

83-001733 Cooper, C. L.; C. E. Herdendorf; J. J. Mizera and A.M. White. LIMNETIC LARVAL FISH IN THE NEARSHORE ZONE OF THE SOUTH SHORE OF THE CENTRAL BASIN OF LAKE ERIE. *Ohio J. Sci.* 83(3):138-140 SFA 28(3)
[Cent. Lake Erie Area Res., Ohio State Univ., Columbus 43210]

83-001734 Dial, R. S. and S. C. Wainright. NEW DISTRIBUTIONAL RECORDS FOR NON-NATIVE FISHES IN FLORIDA. *Fla. Sci.* 46(1):8-15. 1983. SFA 28(3)
[Dep. Biol. Sci., Fla. Atl. Univ., Boca Raton 33431]

83-001735 Dolganov, V. N. DISCOVERY OF A RARE RABBITFISH SPECIES, *CHIMAERA OWSTONI* (HOLOCEPHALI, CHIMAERIDAE), IN THE REGION OF THE NORTHWESTERN UNDERWATER RIDGE. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(6):145-146. 1982. SFA 28(3)
[TINRO, Vladivostok, USSR]

83-001736 Dolganov, V. N. NEW RECORDS FOR *RHINORAJA LONGICAUDA* (RAJIDAE, ELASMOBRANCHII) AND *HYDROLAGUS BARBOURI* (CHIMAERIDAE, HOLOCEPHALI). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(4):143-145. 1982. SFA 28(3)
[TINRO, Vladivostok, USSR]

83-001737 Eaton, S. W.; R. J. Nemecek and M. M. Kozubowski. FISHES OF THE ALLEGHENY RIVER ABOVE KINZUA DAM. *N.Y. Fish Game J.* 29(2):189-198. July 1982. SFA 28(3)

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

83-001737 CONTINUED
[Dep. Biol., St. Bonaventure Univ., St. Bonaventure, NY 14778] Completion of the Kinzua Dam on the Allegheny River in 1967 blocked further immigration of fish from downstream. The 79 species recorded in the drainage above the dam since 1900 are listed, of which 72 have been reported since 1967. The status of the infrequently collected species is summarized. Sixteen species that are strictly river fishes have been a significant part of the habitat flooded by the dam.

83-001738 Ermakov, Y. K. POPULATIONS OF PACIFIC HAKE, *MERLUCCIUS PRODUCTUS* (MERLUCCIDAE), AND THE BOUNDARIES OF DISTRIBUTION. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(5):153-156. 1982. SFA 28(3)
[TINRO, Vladivostok, USSR]

83-001739 Fago, D. DISTRIBUTION AND RELATIVE ABUNDANCE OF FISHES IN WISCONSIN. I. GREATER ROCK RIVER BASIN. *Bull. Wis. Dep. Nat. Resour. Tech. Bull.* No. 136. 120p. 1982. SFA 28(3)
[3911 Fish Hatchery Road, Madison, WI 53711]

83-001740 Felley, J. D. and L. G. Hill. MULTIVARIATE ASSESSMENT OF ENVIRONMENTAL PREFERENCES OF CYPRINID FISHES OF THE ILLINOIS RIVER, OKLAHOMA. *Am. Midl. Nat.* 109(2):209-221. Apr. 1983. SFA 28(3)
[Dep. Biol., McNeese State Univ., Lake Charles, LA 70609]

83-001741 Fisher, W. L. and J. R. Gammon. THE FISHES OF EAGLE, STOTTS AND RATTLESNAKE CREEKS IN CENTRAL INDIANA. *Proc. Indiana Acad. Sci.* 91:195-196. 1981(1982). Abstract only. SFA 28(3)
[Water Resour. Lab., Univ. Louisville, Louisville, KY 40292]

83-001742 Gilmore, R. G. and P. A. Hastings. OBSERVATIONS ON THE ECOLOGY AND DISTRIBUTION OF CERTAIN TROPICAL PERIPHERAL FISHES IN FLORIDA. *Fla. Sci.* 46(1):31-51. 1983. SFA 28(3)
[Harbor Br. Found., RR1, Box 196, Ft. Pierre, FL 33450.] Maximum densities of east-central Florida populations of the tropical peripheral fishes, *Oostethus brachyurus lineatus, Gobiomorous dormitor, Awaous tajasica* and *Gobionellus pseudofasciatus* occured during the winter and spring monthes in the lower portions of freshwater tributaries to the Indian River Lagoon. All populations declined during the wet season, reaching minimum levels during peak rainfall periods. Specific microhabitat requirements were observed for each species. These species have a limited Florida range which is discussed relative to various environmental parameters and dispersal mechanisms, such as water temperature regimes, oceanic current patterns and particular microhabitat preferences.

83-001743 Gilmore, R. G.; P. A. Hastings and D. J. Herrema. ICHTHYOFAUNAL ADDITIONS TO THE INDIAN RIVER LAGOON AND ADJACENT WATERS, EAST-CENTRAL FLORIDA. *Fla. Sci.* 46(1):22-30. 1983. SFA 28(3)
[Harbor Br. Found., RR1, Box 196, Ft. Pierre, FL 33450]

83-001744 Grady, J. M.; R. C. Cashner and J. S. Rogers. FISHES OF THE BAYOU SARA DRAINAGE, LOUISIANA AND MISSISSIPPI, WITH A DISCRIMINANT FUNCTIONS ANALYSIS OF FACTORS INFLUENCING SPECIES DISTRIBUTION. *Tulane Stud. Zool. Bot.* 24(2):83-100. 20 July 1983. SFA 28(3)
[Dep. Zool., South. Ill. Univ., Carbondale 62901]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

83-001745 Greenberg, L. A. FIRST RECORD OF THE BANDED DARTER IN THE NEW YORK PART OF THE SUSQUEHANNA RIVER DRAINAGE. *N.Y. Fish Game J.* 29(2):215-216. July 1982. SFA 28(3)
[Langmuir Lab., Cornell Univ., Ithaca, NY 14853]

83-001746 Henley, J. P. THE INVENTORY AND CLASSIFICATION OF STREAMS IN THE SALT RIVER DRAINAGE. *Ky. Dep. Fish Wildl. Resour. Bull.* No. 67. 85p. Mar. 1983. SFA 28(3)

83-001747 Kawamura, H. [FRESHWATER FISHES IN THE EASTERN HIDAKA COAST AND CAPE ERIMO IN HOKKAIDO, JAPAN.] *Sci. Rep. Hokkaido Fish Hatchery* No. 37. p. 1-12. Dec. 1982. In Japanese with English summ. SFA 28(3)
[Hokkaido Fish Hatchery, Nakanoshima, Toyohira-ku, Sapporo, Hokkaido, Japan]

83-001748 Marguiles, D. A PRELIMINARY GUIDE TO THE IDENTIFICATION OF FAMILIES OF LARVAL FISHES OCCURRING IN THE OHIO RIVER. *Ohio J. Sci.* 83(3):135-138. June 1983. SFA 28(3)
[Chesapeake Biol. Lab., Univ. Md., Box 38, Solomons 20688]

83-001749 Marsh, P. C. and W. L. Minckley. ESCAPE OF HYBRID GRASS X BIGHEAD CARP INTO CENTRAL ARIZONA. *N. Am. J. Fish. Manage.* 3(2):216-217. 1983. SFA 28(3)
[Cent. Environ. Stud., Ariz. State Univ., Tempe 85287]

83-001750 McReynolds, H. E. THE DEGREE OF LIKENESS OF INTERBASIN AND INTRABASIN FISH FAUNAS AS MEASURED BY SIMILARITY COEFFICIENTS. *Proc. Indiana Acad. Sci.* 91:198-199. 1981(1982). Abstract only. SFA 28(3)
[U.S. For. Serv., Bedford, IN 47521]

83-001751 Minckley, W. L. STATUS OF THE RAZORBACK SUCKER, *XYRAUCHEN TEXANUS* (ABBOTT), IN THE LOWER COLORADO RIVER BASIN. *Southwest. Nat.* 28(2):165-187. 20 May 1983. SFA 28(3)
[Dep. Zool., Ariz. State Univ., Tempe 85287] The razorback sucker population of the lower Colorado River basin is now reduced to scattered individuals in all but Lake Mohave, Arizona-Nevada. That population consists of large, slowly-growing fish, which are proposed to be nearly 30 years old, presumably having hatched when the reservoir was filling in the early 1950s. The species comprised about 12.5% of all fishes taken by trammel netting in Lake Mohave in the period 1974-82. No recruitment into the population has been detected in that period, despite repeated observations of spawning and records of fertilized eggs and hatched larvae. Sex ratios, sexual dimorphism, and fecundity all indicate the fish to be reproductively capable despite a high incidence of disease. The species is now under artificial propagation, and is being reintroduced within its native range. Predation by introduced fishes on early life-history stages of razorback sucker is considered the most important factor in their decline.

83-001752 Morgans, J. F. C. SERRANID FISHES OF TANZANIA AND KENYA. *Ichthyol. Bull. J. L. B. Smith Inst. Ichthyol.* No. 46. 44p. May 1982. SFA 28(3)
[J. L. B. Smith Inst. Ichthyol., Grahamstown, South Africa]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

83-001753 Murdy, E. O.; R. E. Matheson, Jr.; J. D. Fechhelm and M. J. McCoid. MIDWATER FISHES OF THE GULF OF MEXICO COLLECTED FROM THE R/V *ALAMINOS*, 1965-1973. *Tex. J. Sci.* 35(2):109-127. July 1983. SFA 28(3)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843]

83-001754 Paulin, C. D. SCORPIONFISHES OF NEW ZEALAND (PISCES: SCORPAENIDAE). *N.Z. J. Zool.* 9(4):437-450. 1982. SFA 28(3)
[Natl. Mus. N.Z., Private Bag, Wellington, New Zealand]

83-001755 Peters, E. J. NEW DISTRIBUTIONAL RECORDS OF THE COMMON SHINER (*NOTROPIS CORNUTUS*) AND THE BLUNTNOSE MINNOW (*PIMEPHALES NOTATUS*) IN THE LITTLE BLUE RIVER SYSTEM IN NEBRASKA. *Prairie Nat.* 15(1):38-40. Mar. 1983. SFA 28(3)
[Dep. For. Fish. Wildl., Univ. Nebr., Lincoln 68583-0819]

83-001756 Propst, D. L. WARMWATER FISHES OF THE PLATTE RIVER BASIN, COLORADO; DISTRIBUTION, ECOLOGY, AND COMMUNITY DYNAMICS. *Ph.D. dissertation, Colo. State Univ.* 301p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(11):3471. May 1983. SFA 28(3)

Warmwater stream reaches of the Platte River basin, Colorado were sampled for 2-½ years (1978-1980) to determine the distribution and ecology of fishes. Twenty-eight fish species (exclusive of *Salmo clarki stomias* and *Stizostedion vitreum*) are believed to have been native. Of these, *Couesius plumbeus*, *Notropis heterolepis*, and *Nocomis biguttatus* have been extirpated. *Dorosoma cepedianum* and *Culaea inconstans* were not included in historic accounts of Platte River basin fishes but are believed to be native. Eight native species were rare, six were uncommon, and eleven were common. Degradation of habitats by anthropogenic pollutants, dewatering of streams, and agricultural runoff was responsible for the limited ranges and abundance of rare and uncommon species. Tolerance of a wide range of environmental conditions and availability of preferred habitat were responsible for the abundance of common species. *Cyprinus carpio* was the only common non-native species. Fish species number increased gradually in a downstream direction. Community changes were strongly correlated with increased habitat dimensions and stability. Specific habitat requirements as molded by evolutionary origins imposed limits upon the ranges of some species and influenced the relative abundance of others. Northern-origin species occurred mainly in foothill streams, southern-origin fishes were restricted to lower stream reaches, and fishes of mixed origin (occupying more than one pre-Pleistocene basin) were found throughout the system.

83-001757 Ré, P.; A. Farinha and I. Meneses. ICHTHYOPLANKTON FROM THE COAST OF PENICHE (PORTUGAL) (1979/80). *Arq. Mus. Bocage Ser. A* 1(16):369-401. 1982. SFA 28(3)
[Inst. Nac. Invest. Cient., Lisbon, Portugal]

83-001758 Randall, J. E. and R. W. Bruce. THE PARROTFISHES OF THE SUBFAMILY SCARINAE OF THE WESTERN INDIAN OCEAN WITH DESCRIPTIONS OF THREE NEW SPECIES. *Ichthyol. Bull. J. L. B. Smith Inst. Ichthyol.* No. 47. 39p. Mar. 1983. SFA 28(3)
[J. L. B. Smith Inst. Ichthyol., Grahamstown, South Africa]

83-001759 Roberts, C. D. and J. Van Berkel. ADDITIONAL RECORDS OF MARINE FISHES FROM KAIKOURA. *Mauri Ora* 10:133-137. 1982. SFA 28(3)
[Dep. Zool., Victoria Univ. Wellington, Wellington, New Zealand]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

83-001759 CONTINUED Twenty-nine marine fish species are listed with information on reference specimens, details of capture, habitat and biological observations. Ten species are recorded for the first time from the Kaikoura area and the occurrence of two species, previously reported as unverified records, is confirmed.

83-001760 Sever, D. M. and E. D. Mould. THE OCCURRENCE OF *ICHTHYOMYZON CASTANEUS* (PETROMYZONTIDAE) IN THE SAINT JOSEPH RIVER DRAINAGE OF INDIANA. *Proc. Indiana Acad. Sci.* 91:618-620. 1981(1982). SFA 28(3)
[Dep. Biol., Saint Mary's Coll., Notre Dame, IN 46556]

83-001761 Tweddle, D. and N. G. Willoughby. THE DISTRIBUTION AND IDENTIFICATION OF MORMYRID FISHES IN MALAWI, WITH NOTES ON THE SYNONYMY OF *MARCUSENIUS NYASENSIS* AND *M. LIVINGSTONII* (MORMYRIFORMES: MORMYRIDAE). *J. L. B. Smith Inst. Ichthyol. Spec. Publ.* No. 24. 9p. Sept. 1982. SFA 28(3)
[Fish. Res. Stn., P.O. Box 27, Monkey Bay, Malawi]

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

83-001762 Angermeier, P. L. THE IMPORTANCE OF COVER AND OTHER HABITAT FEATURES TO THE DISTRIBUTION AND ABUNDANCE OF ILLINOIS STREAM FISHES. *Ph.D. dissertation, Univ. Ill.* 137p. 1983. From Diss. Abstr. Int. B Sci. Eng. 43(12):3830. June 1983. SFA 28(3)

Effects of spatio-temporal changes in habitat structure on the distribution and abundance of stream fishes were assessed using field and laboratory results. Fish distributions in several small Illinois streams were related to the availability of depth and cover features using survey data and cover manipulations. Large fish were more often associated with deep areas and cover than small fish; centarchids were more often associated with these features than cyprinids. Depth was a better predictor of fish distribution than cover, but correlates between fish abundances and habitat features varied among streams and years. In general, fish were more strongly associated with habitat features in homogeneous streams than in structurally complex ones. Removal of woody debris affected channel morphology, organic litter and fish abundances in upstream areas. Compared with unaltered sites, altered sites suffered accentuated losses of deep habitats during low-flow periods due to filling by fine, shifting substrates. In addition, the abundance of organic litter covering the stream bottom was reduced in altered sites. Effects were less pronounced the follwing year, when exceptionally high precipitation maintained stable stream discharge throughout the year. Fish abundance and community structure exhibited increased temporal instability in altered sites relative to unaltered sites. Effects of debris removal were minimal in a downstream area where coarse, stable substrates predominated. Effects of current and predator presence on cover use by small fish were examined in a laboratory stream. Small sunfish were more attracted to cover than small cyprinids. Small fish increased their use of cover in the absence of current and were less active when predators were present. Sunfish avoided predators better in the presence of current, but cyprinids did not. Effects of fish consumption on the abundance of benthic invertebrates were evaluated using paired screen exclosure. One exclosure of each pair allowed access to fish (open exclosure), while the other did not (closed exclosure). Upstream densities of the most abundant invertebrate taxa and the largest individuals were greater in closed than in open exclosures, but downstream densities did not follow these patterns.

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

83-001763 Galat, D. L. PRIMARY PRODUCTION AS A PREDICTOR OF POTNETIAL FISH PRODUCTION: APPLICATION TO PYRAMID LAKE, NEVADA. *Ph.D. dissertation, Colo. State Univ.* 178p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(11):3481. May 1983. SFA 28(3)

Potential tui chub and Lahontan cutthroat trout production were empirically predicted from annual organic matter influxes to Pyramid Lake and the conversion efficiency of gross photosynthesis to tui chub production in large microcosms of Pyramid Lake. Organic matter imputs to Pyramid Lake averaged 405,545 Mg O_2/yr. Phytoplanton gross photosynthesis supplied between 88.5 and 99.6% of the total; allochthonous imputs contributed less than 2.5%. Conversion of microcosm gross photosynthesis to tui chub production averaged 1.13%. Extrapolating ranges of results to Pyramid lake yielded a potential tui chub production between 55 and 200 kg/ha/yr. Fifteen scenarios of Lahontan cutthroat trout production, ranging between 5 and 80 kg/ha/yr, were projected under various assumptions about trout food habits and transfer efficiencies from tui chub to trout. Three runs of a simplistic fish production model simulated Lahontan cutthroat trout recruitments required to realize this range of potential production. Growth, mortality rates, and ages at recruitment were varied to illustrate how these variables affect recruitment and production. Economic and social factors were not included in the model. When survival was set at 1.0% through age 7 (Run 1), recruitment of 6.9 million age-1 trout was required to attain the median produciton scenario of 21 kg/ha/yr. A 30% harvest of median potential trout production available to a trophy sport fishery yielded 70,830 kg/yr. When mortality was defined as independent of age at recruitment (Run 2), 7.7 million age-0.5 trout *versus* 4.6 million age-2.0 fish had to be recruited to meet the median potential production scenario. When mortality was defined to be inversely related to age at recruitment and total biomass at recruitment was uniform regardless of age, Run 3 demonstrated that total production of trout recruited at 2.0 was 66% less than for age-0.5 trout. However, 61% more total trout biomass recuited at age 2.0 than at age 0.5 was available to the trophy sport fishery. Simulations illustrated that a greater proportion of total trout production enters the trophy fishery when older and larger fish are recruited.

83-001764 Ivanova, M. N. THE INFLUENCE OF ENVIRONMENTAL CONDITIONS ON THE POPULATION DYNAMICS OF SMELT, *OSMERUS EPERLANUS* (OSMERIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(6):45-51. 1982. SFA 28(3)

[Inst. Biol. Inland Waters, USSR Acad. Sci., Borok, Yaroslavl Reg., USSR] Water temperature during the larval period of development and the foraging period of adult fish, as well as availability of food during overwintering determine the life span and population dynamics of the smelt, *Osmerus eperlaus* in individual lakes.

83-001765 Nakatani, T. and T. Maeda. [DISTRIBUTION OF WALLEYE POLLOCK LARVAE AND THEIR FOOD SUPPLY IN FUNKA BAY AND THE ADJACENT WATER, HOKKAIDO.] *Bull. Jpn. Soc. Sci. Fish.* 49(2):183-187. Feb. 1983. In Japanese with English summ. SFA 28(3)

[Fac. Fish., Hokkaido Univ., Minato-3, Hakodate 041, Japan] From the end of 1979 to the early spring of 1980, the spawning ground of walleye pollock *Theragra chalcogramma* (Pallas) was formed in the northeastern area from Shiraoi to Mukawa in contrast to that in recent years. The eggs spawned were transported toward the bay and many of them hatched before they reached the inner area of the bay. The main food organisms of the larvae at the initial feeding stage were the eggs and nauplii of copepods and most of them in the early spring were produced by the spawners of *Pseudocalanus minutus* in this study area. During the same period, the surface water of the Oyashio current was found only at the entrance of the bay, and the Tsugaru Warm Water occupied the inner area of the bay. For this reason, *P. minutus* was

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

83-001765 CONTINUED concentrated at the entrance of the bay and the distribution pattern of *P. minutus* coincided with that of walleye pollock larvae.

83-001766 Saunders, R. L.; E. B. Henderson; B. D. Glebe and E. J. Loudenslager. EVIDENCE OF A MAJOR ENVIRONMENTAL COMPONENT IN DETERMINATION OF THE GRILSE:LARGER SALMON RATIO IN ATLANTIC SALMON (*SALMO SALAR*). *Aquaculture* 33(1-4):107-118. June 1983. SFA 28(3)
[Biol. Stn., St. Andrews, NB E0G 2X0, Canada] Two-year-old smolts of Saint John River stock reared at the Mactaquac Fish Culture Station and released (sea-ranched) from the facility to the Saint John River gave returns to the Mactaquac area of grilse to larger salmon in a ratio of 1.70:1 whereas smolts of the same stock and rearing history gave grilse to immature salmon in a ratio of 0.01:1, following 19 months rearing in a sea cage at Deer Island, New Brunswick. One-year-old smolts gave grilse to larger salmon in a ratio of 0.20:1 following sea-ranching from Mactaquac; cage-reared 1-year-old smolts gave no grilse. Hatchery-reared smolts sea-ranched from the North American Salmon Research Center (NASRC) from 1976-1978 gave higher grilse:larger salmon ratios for Big Salmon River than for Saint John River stocks. Comparable lots of Big Salmon and Saint John smolts sea-ranched from the NASRC in 1980 and cage-reared from 1980-1981 produced few grilse. None of several strains reared in sea-cages during 1980-1981, a particularly cold winter, yielded many grilse. Precocious parr mated with anadromous females of Saint John and Big Salmon stocks in a reciprocal cross produced smolts which yielded a large incidence of grilse in the purebred Big Salmon group, few grilse in the purebred Saint John group, and intermediate numbers in the reciprocal hybrid groups. An hypothesis involving low sea temperature is advanced to explain the difference in incidence of grilse resulting from sea-ranching and cage-rearing smolts of the same stock and hatchery-rearing history.

83-001767 Shulman, M. J. THE STRUCTURE OF CORAL REEF FISH ASSEMBLAGES: EFFECTS OF RESOURCE LIMITATION, PREDATION, AND INTERFERENCE COMPETITION ON RECRUITMENT PATTERNS. *Ph.D. dissertation, Univ. Wash.* 172p. 1983. From Diss. Abstr. Int. B Sci. Eng. 43(12):3836. June 1983. SFA 28(3)

83-001768 Tappel, P. D. and T. C. Bjornn. A NEW METHOD OF RELATING SIZE OF SPAWNING GRAVEL TO SALMONID EMBRYO SURVIVAL. *N. Am. J. Fish. Manage.* 3(2):123-135. 1983. SFA 28(3)
[U.S. For. Serv., Fed. Bldg., Ketchikan, AK 99901]

IDENTIFICATION, KEYS, CLASSIFICATION

83-001769 Allison, I. S. and C. E. Bond. IDENTITY AND PROBABLE AGE OF SALMONIDS FROM SURFACE DEPOSITS AT FOSSIL LAKE, OREGON. *Copeia* 1983(2):563-564. 6 May 1983. SFA 28(3)
[Dep. Geol., Oreg. State Univ., Corvallis 97331]

83-001770 Andriyashev, A. P. A REVIEW OF THE GENUS *PARALIPARIS* (LIPARIDAE) FROM THE EASTERN ANTARCTIC. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(4):1-12. 1982. SFA 28(3)
[Inst. Zool., USSR Acad. Sci., Leningrad, USSR]

IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

83-001771 Balushkin, A. V. and Y. Y. Permitin. DISCOVERY OF NEW SUBSPECIES OF *PATAGONOTOTHEN GUENTHERI* (NOTOTHENIIDAE) OFF SHAG ROCKS NEAR SOUTH GEORGIA, ANTARCTICA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(4):13-18. 1982. SFA 28(3)
[Inst. Zool., USSR Acad. Sci., Leningrad, USSR]

83-001772 Baruš, V.; J. Libosvárský and F. Gerra Padrón. *GAMBUSIA PUNCTATA* AND *G. RHIZOPHORAE* (POECILIIDAE) FROM CUBA, THEIR IDENTIFICAITON AND DISTRIBUTION. *Folia Zool.* 31(4):357-367. 1982. SFA 28(3)
[Inst. Vet. Zool., Czech. Acad. Sci., Brno, Czechoslovakia]

83-001773 Bath, H. *LIPOPHRYS SABRY* N. SP. VON DER MITTELMEERKÜSTE LIBYENS (PISCES: BLENNIIDAE). [*LIPOPHRYS SABRY* N. SP. FROM THE LIBYAN MEDITERRANEAN (PISCES: BLENNIIDAE).] *Senckenbergiana Biol.* 63(3-4):153-160. 1982. In German with English summ. SFA 28(3)
[Luisenstr. 45, D-6780 Pirmasens, West Germany]

83-001774 Busakhin, S. V. SYSTEMATICS AND DISTRIBUTION OF THE FAMILY BERYCIDAE (OSTEICHTHYES) IN THE WORLD OCEAN. *J. Ichthyol. (Eng. Transl. Vopr. Ikhtiol.)* 22(6):1-21. 1982. SFA 28(3)
[VNIRO, Moscow, USSR]

83-001775 Chereshnev, I. A. THE TAXONOMIC STATUS OF SYMPATRIC DIADROMOUS CHARS OF THE GENUS *SALVELINUS* (SALMONIDAE) FROM EASTERN CHUKOTKA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 22(6):22-38.* 1982. SFA 28(3)
[Biol. Soil Inst., Far East. Sci. Cent., USSR Acad. Sci.; Vladivostok, USSR]

83-001776 Churikov, A. A. and É. K. Sabitov. ADDENDUM TO THE IDENTIFICATION OF THE EASTERN REDFINS OF THE GENUS *TRIBOLODON* (CYPRINIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(5):157-159. 1982. SFA 28(3)
[VNIRO, Moscow, USSR]

83-001777 Cloutman, D. G. and L. L. Olmsted. VERNACULAR NAMES OF FRESHWATER FISHES OF THE SOUTHEASTERN UNITED STATES. *Fisheries (Bull. Am. Fish. Soc.)* 8(2):7-11. Mar.-Apr. 1983. SFA 28(3)
[Box 288, Burdett, KS 67523]

83-001778 Deng Siming; Xiong Guoqiang and Zhan Hongxi. [DESCRIPTION OF THREE NEW SPECIES OF ELASMOBRANCHIATE FISHES FROM DEEP WATERS OF THE EAST CHINA SEA.] *Oceanol. Limnol. Sin.* 14(1):64-70. 1983. In Chinese with English summ. SFA 28(3)
[East China Sea Fish. Inst., Natl. Bur. Fish. China, China]

83-001779 Esmond, E. F. and J. R. Stauffer, Jr. TAXOMETRIC COMPARISON OF THE ATLANTIC SLOPE AND OHIO RIVER POPULATIONS OF *ETHEOSTOMA CAERULEUM* STORER. *Am. Midl. Nat.* 109(2):390-397. Apr. 1983. SFA 28(3)

IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

83-001779 CONTINUED
[Cent. Environ. Estuarine Stud., Frostburg State Coll.-Gunter Hall, Frostburg, MD 21532] Morphometric and meristic data of *Etheostoma caeruleum* Storer from the Gauley, Janawah, Monongahela and Potomac drainages were compared using discriminant analysis. Ten of 21 characters from the four drainages had group means which were significantly different ($P \leq .05$), and the group centroids were significantly different ($P \leq .05$). The discriminant analysis, which maximizes group differences, could correctly assign 67% of the specimens to the *a priori* group. Unexpected variation was observed in anal spine and pelvic ray counts from two drainages.

83-001780 Fedorov, V. V. A NEW EELPOUT, *HADROPOGONICHTHYS LINDBERGI* FERODOV, GEN. ET SP. NOV. (ZOARCIDAE), FROM THE BATHYAL DEPTHS OF THE FOURTH KURIL STRAIT. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(5):16-23. 1982. SFA 28(3)
[Zool. Inst., USSR Acad. Sci., Leningrad, USSR]

83-001781 Ganyung, Y. and X. Congixin. [A NEW SPECIES OF FISHES FORM MOUNT SHENNONG.] *Zool. Res.* 4(1):71-74. 1983. In Chinese with English summ. SFA 28(3)
[Dep. Fish., Cent. China Agric. Coll., China]

83-001782 Gomon, J. R. and W. R. Taylor. *PLOTOSUS NKUNGA*, A NEW SPECIES OF CATFISH FROM SOUTH AFRICA, WITH A REDESCRIPTION OF *PLOTOSUS LIMBATUS* VALENCIENNES AND KEY TO THE SPECIES OF *PLOTOSUS* (SILURIFORMES: PLOTOSIDAE). *J. L. B. South Inst. Ichthyol. Spec. Publ.* No. 22. 16p. Aug. 1982. SFA 28(3)
[Div. Fish., Natl. Mus. Nat. Hist., Washington, DC 20560]

83-001783 Greenfield, D. W. *GAMBUSIA XANTHOSOMA*, A NEW SPECIES OF POECILIID FISH FROM GRAND CAYMAN ISLAND, BWI. *Copeia* 1983(2):457-464. 6 May 1983. SFA 28(3)
[Dep. Biol. Sci., North. Ill. Univ., DeKalb 60115]

83-001784 Greenwood, P. H. THE *OPHTHALMOTILAPIA* ASSEMBLAGE OF CICHLID FISHES RECONSIDERED. *Bull. Br. Mus. (Nat. Hist.)* 44(4):249-290. 28 Apr. 1983. SFA 28(3)
[Dep. Zool., Br. Mus. (Nat. Hist.), Cromwell Rd., London SW7 5BD, Canada]

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[J.L. Fryer: Dep. Microbiol., Oreg. State Univ., Corvallis 97331-3804] Chinook salmon, *Oncorhynchus tshawytscha* (Walbaum), and rainbow trout, *Salmo gairdneri* Richardson, were used to determine if sublethal copper exposure would increase their susceptibility to *Vibrio anguillarum* infection. Fish were pretreated with copper at fractional levels of the 96h copper LC_{50} before exposure to the pathogen. Mortality by vibriosis was greater among fish exposed to 9% of the copper LC_{50} for 96h than unexposed fish. Peak susceptibility to vibriosis depended in part on the interaction of exposure time and copper concentration. The higher copper concentrations produced peak susceptibility to infection in shorter time periods. After the peak of susceptibility, sensitivity to infection declined to near control levels in those fish where exposure was continued. Rainbow trout stressed by copper required about 50% fewer pathogens to induce a fatal infection than non-copper exposed fish.

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[U.S. FWS, Natl. Fish Health Res. Lab., Kearneysville, WV 25430.]

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[Inst. Aquacult., Univ. Stirling, Stirling, FK9 4LA, Scotland] The factors influencing the uptake of a ^{14}C-labelled *Vibrio anguillarum* vaccine in direct immersion experiments with rainbow trout, *Salmo gairdneri* were studied. Immersion times of longer than 10 s did not increase vaccine uptake. A pre-immersion dip in a hyperosmotic solution had no effect on uptake, even at lower vaccine bath concentrations. It appeared that the head end of the fish was implicated in uptake. Vaccine uptake decreased at lower temperatures, whereas the use of an adjuvanted vaccine and a soluble vaccine preparation led to increased uptake. Larger fish took up more vaccine.

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[U.S. FWS, Natl. Fish Health Res. Lab., Kearneysville, WV 25430] Tubificid oligochaetes, which bore infectivity for whirling disease, harbored an organism of the genus *Triactinomyxon*, and that sporoxoan gave a positive reaction in direct flourescent antibody test with anti-*Myxosoma cerebralis* serum. Triactinomyxons were found only in populations of tubificids that had been kept in contact with *M. cerebralis* spores for 3 to 4 months. Mature Triactinomyxons were first found about 3.5 months after *M. cerebralis* spores were placed with the tubificids. Soon after, the

BACTERIAL DISEASES (CONTINUED)

83-001824 CONTINUED Triactinomyxons were also waterborne, and it became possible to harvest them by differential screening. Triactinomyxons were selectively concentrated on 50 µm screen where earlier work showed peak infectivity of whirling disease was trapped. Experimental transmission of the Triactinomyxon by exposure, intubation and intraperitoneal and intramuscular injection of susceptible rainbow trout fry is in progress. Results of those tests are expected to confirm the identity of the infective stage of salmonid whirling disease.

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[Hokkaido Fish Hatchery, Nakanoshima, Toyohira-ku, Sapporo, Hokkaido, Japan]

83-001827 Cheung, P. J.; R. F. Nigrelli and G. D. Ruggieri. *PENTACAPSULA MUSCULARIS* SP. NOV. (MYXOSPOREA: PENTACAPSULIDAE); A HISTOZOIC PARASITE OF BUTTERFLYFISH, *CHAETODON COLLARE* BLOCH. *J. Fish Dis.* 6(4):393-395. July 1983. SFA 28(3)
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[NMFS, Hammond Field Stn., P.O. Box 155, Hammond, OR 97121]

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[P.O. Box 5667, St. John's, NF A1C 5X1, Canada]

83-001830 Hua Ding-ke and Dong Han-ji. A NEW SPECIES OF *PLEISTOPHORA* FROM BIG-EYES, *PRIACANTHUS TAYENUS* RICHARDSON, AND *P. MACRACANTHUS* CUVIER AND VALENCIENNES, FROM THE SOUTH CHINA SEA. *J. Fish Dis.* 6(3):293-301. May 1983. SFA 28(3)
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A collection of papers.--RS

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[Sch. Fish. Sci., Univ. Alaska, 11120 Glacier Hwy., Juneau 99801]

83-001842 Mulcahy, D.; R. J. Pascho and C. K. Jenes. DETECTION OF INFECTIOUS HAEMATOPOIETIC NECROSIS VIRUS IN RIVER WATER AND DEMONSTRATION OF WATERBORNE TRANSMISSION. *J. Fish Dis.* 6(4):321-330. July 1983. SFA 28(3)
[U.S. FWS, Natl. Fish. Res. Cent., Bldg. 204, Naval Support Activity, Seattle, WA 98115]

83-001843 Watanabe, T. and K. Yamamori. VIRUS-LIKE PARTICLES IN THE SPLEEN HEMATOPOIETIC TISSUE OF PUFFER *FUGU PARDALE*. *Bull. Jpn. Soc. Sci. Fish.* 49(2):307. Feb. 1983. SFA 28(3)
[Dep. Vet. Med., Nihon Univ., Kameino, Fujisawa 252, Japan]

83-001844 Watanabe, T. PERSISTENT INFECTION IN YNK CELLS WITH INFECTIOUS HEMATOPOIETIC NECROSIS VIRUS (IHNV). *Bull. Jpn. Soc. Sci. Fish.* 49(2):157-163. Feb. 1983. SFA 28(3)
[Dep. Vet. Med., Nihon Univ., Kameino 1866, Fujisawa, Kanagawa 252, Japan]

OTHER DISEASES AND PARASITES

83-001845 ACUIGRUP. STUDIES ON THE NUTRITIONAL AETIOLOGY OF SYSTEMIC GRANULOMA IN GILT HEAD BREAM (*SPARUS AURATA L.*). *Riv. It. Piscic. Ittiop.* 18(1):21-26. Jan.-Mar. 1983. In English and Italian. SFA 28(3)
[Lat. Ictiopatol., Manuel Sarrion n. 8, Madrid-20, Spain]

83-001846 Bashirullah, A. K. M. and J. R. Adams. *PHILONEMA ONCORHYNCHI:* EFFECT OF HORMONES ON MATURATION IN ANADROMOUS SOCKEYE, *ONCORHYNCHUS NERKA*. *Int. J. Parasitol.* 13(3):261-265. June 1983. SFA 28(3)
[Inst. Oceanogr., Univ. Oriente, Apt.-94 Cumana 6101, Venezuela]

83-001847 Berg, L.; A. Moretti and A. [CALCOLOSI IN LARVAE DI ORATA (*SPARUS AUATUS* L.)E BRANZINO (*DICENTRARCHUS LABRAX* L.) IN ALLEVAMENTO: PRIMI RISULTATI.] CALAULOSIS IN REARED LARVAE OF GILTHEAD SEA

OTHER DISEASES AND PARASITES (CONTINUED)

83-001847 CONTINUED BREAM (*SPARUS AURATUS*) AND SEA BASS (*DICENTRARCHUS LABRAX*) FIRST RESULTS. *Riv. It. Piscic. Ittiop.* 18(1):16-20. Jan.-Mar. 1983 SFA 28(3)
[S.I.R.A.P., Via Murazzi 1238, I-30010 Pellestrina, Venice, Italy]

83-001848 Black, G. A. TAXONOMY OF A SWIMBLADDER NEMATODE, *CYSTIDICOLA STIGMATURA* (LEIDY), AND EVIDENCE OF ITS DECLINE IN THE GREAT LAKES. *Can. J. Fish. Aquatic Sci.* 40(5):643-647. May 1983. In English with French summ. SFA 28(3)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

83-001849 Black, G. A.; W. L. Montgomery and F. G. Whoriskey. ABUNDANCE AND DISTRIBUTION OF *SALMINCOLA EDWARDSII* (COPEPODA) ON ANADROMOUS BROOK TROUT, *SALVELINUS FONTINALIS*, (MITCHILL) IN THE MOISIE RIVER SYSTEM, QUEBEC. *J. Fish Biol.* 22(5):567-575. May 1983. SFA 28(3)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

83-001850 Blazer, V. S. and R. E. Wolke. CEROID DEPOSITION, RETINAL DEGENERATION AND RENAL CALCIUM OXALATE CRYSTALS IN CULTURED CLOWNFISH, *AMPHIPRION OCELLARIS*. *J. Fish Dis.* 6(4):365-376. July 1983. SFA 28(3)
[R.E. Wolke: Dep. Aquacult. Sci. Pathol., Univ. R.I., Kingston 02881] A clinical syndrome characterized by blindness, loss of pigmentation, erratic swimming behaviour and increased mortality is described in cultured clownfish, *Amphiprion ocellaris*. Histopathological examination of affected fish revealed retinal degeneration, extensive ceroid deposits in visceral and muscle macrophage accumulations, and renal tubular calcium oxalate crystals. The syndrome is discussed in relation to deficiencies of the fat soluble vitamins A and E and lipid peroxidation. Changes in diet correcting these imbalances resulted in a disappearance of the syndrome.

83-001851 Conroy, G.; D. A. Conroy and J. M. Torrealba. *FLORIDOSENTIS MUGILIS* (MACHADO FILHO, 1951) WARD, 1953 (ACANTHOCEPHALA: NEOECHINORHYNCHIDAE) IN WHITE MULLET (*MUGIL CUREMA* VAL.) FROM VENEZUELAN COASTAL WATERS. *Riv. It. Piscic. Ittiop.* 18(1):31-43. Jan.-Mar. 1983. In English and Italian. SFA 28(3)
[Fac. Cienc. Vet., Univ. Cent. Venezuela, Maracay, Venezuela]

83-001852 Huizinga, H. W. and J. Budd. NEPHROBLASTOMA IN THE SMELT, *OSMERUS MORDAX* (MITCHILL). *J. Fish Dis.* 6(4):389-391. July 1983. SFA 28(3)
[Dep. Biol. Sci., Ill. State Univ., Normal 61761]

83-001853 Kruse, G. O. W. TAXONOMIC AND ZOOGEOGRAPHICAL STUDIES OF DIGENETIC TREMATODES OF MARINE TELEOSTS FROM THE SOUTH AUSTRALIAN SEA. *Ph.D. dissertation, Univ. Nebr. (Lincoln)* 302p. 1981. From Diss. Abstr. Int. B Sci. Eng. 43(11):3503. May 1983. SFA 28(3)

83-001854 Mhaisen, F. T. OCCURRENCE OF *LECITHOCHIRIUM GRAVIDUM* LOOSS, 1907 (DIGENEA: HEMIURIDAE) FROM THE EEL, *ANGUILLA ANGUILLA*. *J. Parasitol.* 69(2):345. Apr. 1983. SFA 28(3)
[Dep. Fish. Mar. Resour., Coll. Agric., Univ. Basrah, Basrah, Iraq]

OTHER DISEASES AND PARASITES (CONTINUED)

83-001855 Nikol, B. B. and N. Samuel. GEOGRAPHICAL DISTRIBUTION OF ACANTHOCEPHALA IN NEBRASKA FISHES. *Trans. Nebr. Acad. Sci.* 11:31-52. 1983. SFA 28(3)
[Sch. Life Sci., Univ. Nebr., Lincoln, 68588-0118

83-001856 Pronina, S. V. and N. M. Pronin. THE EFFECT OF CESTODE *(TRIAENOPHORUS NODULOSUS)* INFESTATION ON THE DIGESTIVE TRACT OF PIKE *(ESOX LUCIUS). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(4):105-113. 1982. SFA 28(3)
[USSR Acad. Sci., Ulan-Ude, USSR]

83-001857 Rekharani, Z. and R. Madhavi. METACERCARIA OF *GALACTOSOMUM USSURIENSE* OSHMARIN, 1963 (TREMATODA: HETEROPHYIDAE) FROM BRACKISH WATER FISHES OF BHEEMUNIPATNAM (INDIA). *J. Helminthol.* 57(2):91-94. June 1983. SFA 28(3)
[Dep. Zool., Andhra Univ., Waltair 530003, India]

83-001858 Sen Jiwei. [THREE NEW SPECIES OF GENUS *BIVESICULA* YAMAGUTI, 1934 (TREMATODE: BIVESICULIDAE) FROM MARINE FISHES OF CHINA.] *Oceanol. Limnol. Sin.* 13(6):570-576. 1982. In Chinese and English. SFA 28(3)
[Inst. Oceanol., Acad. Sin., China]

83-001859 Shimura, A. SEASONAL OCCURRENCE, SEX RATIO AND SITE PREFERENCE OF *ARGULUS COREGONI* THORELL (CRUSTACEA: BRANCHIURA) PARASITIC ON CULTURED FRESHWATER SALMONIDS IN JAPAN. *Parasitology* 86(3):537-552. June 1983. SFA 28(3)
[Dep. Fish., Fac. Agric., Univ. Tokyo, Yayoi, Bunkyo-ku, Tokyo 113, Japan]

83-001860 Torres, P. and M. Grandjean. *PROLEPTUS NIEDMANNI* SP. N. (NEMATODA: SPIRUROIDEA) FROM A SHARK, *SCHOROEDERICHTHYS CHILENSIS* (GUICHENOT), IN SOUTHERN CHILE. *J. Parasitol.* 69(2):413-415. Apr. 1983. SFA 28(3)
[Inst. Parasitol., Univ. Austral de Chile, Valdivia, Chile]

83-001861 Wang Puqin and Guo Qizhi. [STUDIES ON SOME SPECIES OF HELMINTHS FROM FRESHWATER FISHES IN YUNNAN, CHINA.] *Oceanol. Limnol. Sin.* 14(1):92-102. 1983. In Chinese with English summ. SFA 28(3)
[Parasitol. Res. Lab., Fujian Normal Univ., China]

POLLUTION

83-001862 Black, J. J. FIELD AND LABORATORY STUDIES OF ENVIRONMENTAL CARCINOGENESIS IN NIAGARA RIVER FISH. *J. Great Lakes Res.* 9(2):326-334. 1983. SFA 28(3)
[Roswell Park Memorial Inst., 666 Elm St., Buffalo, NY 14263] Combined field and laboratory studies were carried out to assess the possible role of contaminated bottom sediments to neoplastic disease in fish from eastern Lake Erie and the upper Niagara River. Correlations between sediment polycyclic hydrocarbons, neoplasms in feral fish, and the induction of neoplasms in bullheads (*Ictalurus nebulosus*) by exposure to extracts of polluted

POLLUTION (CONTINUED)

83-001862 CONTINUED sediment support the hypothesis that some fish neoplasms result from exposure to carcinogenic chemicals present in the fishes environment.

83-001863 Cooper, J. J. TOTAL MERCURY IN FISHES AND SELECTED BIOTA IN LAHONTAN RESERVOIR, NEVADA: 1981. *Bull. Environ. Contam. Toxicol.* 31(1):9-17. July 1983. SFA 28(3)
[Bioresour. Cent., Desert Res. Inst., P. O. Box 60220, Reno, NV 89506]

83-001864 Dick, W. A.; J. V. Bonta; F. Haghiri and J. R. Page. STREAM WATER QAULITY OF TWO SMALL WATERSHEDS AS AFFECTED BY SURFACE COAL MINING. *J. Environ. Qual.* 12(3):351-358. July-Sept. 1983. SFA 28(3)
[Dep. Agron., OSU-OARDC Wooster, OH 44691]

83-001865 Haines, T. A.; J. Akielaszek and P. Rago. A REGIONAL SURVEY OF THE CHEMISTRY OF HEADWATER LAKES AND STREAMS IN NEW ENGLAND: VULNERABILITY TO ACIDIFICATION. *U.S. Fish. Wildl. Serv.* FWS/OBS-80/40.15. xv + 141p. Apr. 1983. SFA 28(3)
[U.S. FWS, Columbia Natl. Fish. Res. Lab., Field Res. Stn., Orono, ME 04469]

83-001866 Howells, E. J.; M. E. Howells and J. S. Alabaster. A FIELD INVESTIGATION OF WATER QUALITY, FISH AND INVERTEBRATES IN THE MAWDDACH RIVER SYSTEM, WALES. *J. Fish Biol.* 22(4):447-469. Apr. 1983. SFA 28(3)
[Cremer and Warner, Consulting Engineers and Scientists, 140 Buckingham Palace Rd., London, England] A 3-year study was made of the soft, acid waters of the Rivers Mawddach, Wen and Gain, which contained copper, zinc and iron from natural outcrops and abandoned mines. Invertebrates, typical of acid to neutral streams, were present but there was no pattern in overall numbers or in biomass between stations. However, the abundance and distribution of Ephemeroptera were related to pH and water hardness although not to copper and zinc. Brown trout, *Salmo trutta*, were present and there was little difference in rate of growth between stations, whereas biomass and population density varied considerably between stations, being related to water quality such that, where annual median and 95-percentile of the summed proportions (p) of the threshold LC50 concentrations of copper and zinc of rainbow trout, *S. gairdneri* were 0.3 and 0.7 respectively, biomass was half that in the absence of the metals and, where they were 0.6 and 1.3 respectively, no fish would be expected to occur. Low pH was an additional adverse factor at some locations. Salmon, *S. salar*, failed to populate a tributary where the sum of the *p* *t*LC50 values of copper and zinc was 0.45. High aqueous concentrations of copper resulted in elevated concentrations of copper in the liver of trout, especially in older fish, but not in the muscle. Concentrations of zinc in fish liver and muscle were low despite high ambient concentrations.

83-001867 International Council for the Exploration of the Sea. REPORT OF THE ICES ADVISORY COMMITTEE ON MARINE POLLUTION, 1982. *Int. Counc. Explor. Sea. Coop. Res. Rep.* No. 120. 74p. Jan. 1983. SFA 28(3)
[Palægade 2-4, 1261 Copenhagen K, Denmark]

83-001868 Jothy, A. A.; E. Huschenbeth and U. Harms. ON THE DETECTION OF HEAVY METALS, ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS IN FISH AND SHELLFISH FROM THE COASTAL WATERS OF PENINSULAR MALAYSIA. *Arch.*

POLLUTION (CONTINUED)

83-001868 CONTINUED *Fischereiwiss.* 33(3):161-206. Apr. 1983. In English with German summ. SFA 28(3)
[Fish. Res. Inst., Penang, Malaysia]

83-001869 Klaverkamp, J. F.; M. A. Turner; S. E. Harrison and R. H. Hesslein. FATES OF METAL RADIOTRACERS ADDED TO A WHOLE LAKE: ACCUMULATION IN SLIMY SCULPIN *(COTTUS COGNATUS)* AND WHITE SUCKER *(CATOSTOMUS COMMERSONI). Sci. Total Environ.* 28:119-128. June 1983. SFA 28(3)
[Dep. Fish. Oceans, Freshwater Inst., Winnipeg, MB, Canada]

83-001870 Lemly, A. D. A SIMPLE ACTIVITY QUOTIENT FOR DETECTING POLLUTION-INDUCED STRESS IN FISHES. *Environ. Technol. Lett.* 4(4):173-178. Apr. 1983. SFA 28(3)
[Dep. Biol., Wake Forest Univ., Winston-Salem, NC 27109] An activity quotient (Aq) is described which can be used to detect the stress response of fishes to sublethal concentrations of pollutants. The quotient considers three variables; ventilation frequency (V), coughing rate (C), and pectoral fin activity (PA), and is represented as: $Aq = (V_2-V_1+C_2-C_1(PA_2-PA_1)$. The relative importance of a respiratory component (numerator values) and an activity component (denominator value) were indicated and constancy of one variable does not negate the Aq value. The Aq was found to be adequate to detect stress due to waterbourne selenium and should prove to be a useful tool for screening wastewater and estimating chronically safe toxicant concentrations.

83-001871 Piskunov, L. I.; A. I. Goncharov; V. M. Gushchin and Y. V. Bronnikov. ASSESSMENT OF ARTIFICIAL RADIONUCLIDE CONTENT AND INTERNAL β-RADIATION DOSES IN ROACH, *RUTILUS RUTILUS*, AND BREAM, *ABRAMIS BRAMA* (CYPRINIDAE), OF DIFFERENT AGE. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(5):121-130. 1982. SFA 28(3)
[Soerdlovsk Dist., Sanitary-Epidermiol. Stn., USSR]

83-001872 Queener, P. M. THE ROLE OF SUSPENDED SEDIMENTS IN THE BIOACCUMULATION OF POLYCHLORINATED BIPHENYLS BY FATHEAD MINNOWS *(PIMEPHALES PROMELAS). M.S. thesis, Mich. State Univ.* 72p. 1982. From Masters Abstr. 21(2):119. 1983. SFA 28(3)

83-001873 Suns, K.; G. R. Craig; G. Crawford; G. A. Rees; H. Tosine and J. Osborne. ORGANOCHLORINE CONTAMINANT RESIDUES IN SPOTTAIL SHINERS (*NOTROPIS HUDSONIUS*) FROM THE NIAGARA RIVER. *J. Great Lakes Res.* 9(2):335-340. 1983. SFA 28(3)
[Ontario Mininst. Environ., Water Resour. Br., P.O. Box 213, Rexdale, ON M9W 3L1, Canada]

83-001874 Watt, W. D.; C. D. Scott and W. J. White. EVIDENCE OF ACIDIFICATION OF SOME NOVA SCOTIAN RIVERS AND ITS IMPACT ON ATLANTIC SALMON, *SALMO SALAR. Can. J. Fish. Aquatic Sci.* 40(4):462-473. Apr. 1983. In English with French summ. SFA 28(3)
[Dep. Fish. Oceans, Fish. Res. Br., P.O. Box 550, Halifax, NS B3J 2S7, Canada]

FISH KILLS

83-001875 Bohnsack, J. A. RESILIENCY OF REEF FISH COMMUNITIES IN THE FLORIDA KEYS FOLLOWING A JANUARY 1977 HYPOTHERMAL FISH KILL. *Environ. Biol. Fishes* 9(1):41-53. 1 May 1983. SFA 28(3)

[Dep. Biol., Univ. Miami, Coral Gables, FL 33124] In January 1977, a record breaking cold spell caused fish kills at Big Pine Key, Florida. Census data collected before and after the cold spell from a series of model reefs constructed in 1975 showed a significant drop in mean number of reef fish species and individuals. Following this disturbance, high recruitment of juveniles occurred, presumably due to reduced competition, predation, or a combination of these. Model and natural patch reef communicites examined the summer following the cold spell (1977) were significantly different from those examined the summer before (1976) and the second summer follwing the cold spell (1978). During the summer of 1977, a significantly smaller mean fish size and a significantly greater mean number of species ane individuals were observed. Increased species richness following the cold spell is consistent with the intermediate disturbance hypothesis. Contrary to some theoretical predictions, results suggest reef fish communities are highly resilient to some regional disturbance.

83-001876 Brown, T. E.; A. W. Morley; N. T. Sanderson and R. D. Tait. REPORT OF A LARGE FISH KILL RESULTING FROM NATURAL ACID WATER CONDITIONS IN AUSTRALIA. *J. Fish Biol.* 22(3):335-350. Mar. 1983. SFA 28(3)

[CSR Ltd., Coal Div., 1 O'Connell St., Sydney 2000, Australia] A large natural fish kill which resulted in the deaths of a total of more than 3400 fish comprising eight different species occurred in a freshwater billabong (lagoon or small permanent waterbody) on the Magela Creek in the subtropical Northern Territory of Australia in January, 1980. The fish deaths were assessed to be the result of a combination of natural acid water runoff into the billabong and resultant elevated aquatic biotoxic aluminium levels. Details of water quality changes which occurred during the event and analytical data for the fish killed are provided, together with some explanation of the sequences of occurrence of the fish kill.

83-001877 Cernohous, L. FISH MORTALITY BY THE USE OF EXPLOSIVES IN OAHE RESERVOIR. *N. Dak. Outdoors* 46(1):2-6. July 1983. SFA 28(3)

83-001878 Lassig, B. R. THE EFFECTS OF A CYCLONIC STORM ON CORAL REEF ASSEMBLAGES. *Environ. Biol. Fishes* 9(1):55-63. 1 May 1983. SFA 28(3)

[Cent. Environ. Stud., Macquarie Univ., North Ryde, NSW 2113, Australia] Visual censusing techniques were used to monitor the fish assemblages on eight shallow water coral patch reefs at Lizard Island (north Great Barrier Reef) over a 27 month period. Larval settlement was distinctly seasonal with peaks occurring in December or January. Cyclones are most prevalent at this time of year. Three cyclones passed close to Lizard Island during the study period. Fish assemblages were censused before and immediately after one cyclone that struck at the time of peak larval settlement. The cyclone had little effect on adults but caused high juvenile mortality and re-distribution of sub-adult individuals. Because settlement strongly influences the diversity and density of adults, cyclones have marked effects on the fish assemblages as a whole. The high frequency of tropical storms in many coral reef areas and the depths to which their effects penetrate suggest that physical disturbances may be an important determinant of coral reef fish assemblage structure.

TOXICOLOGY; BIOASSAYS

83-001879 Bengtsson, B. and M. Tarkpea. THE ACUTE AQUATIC TOXICITY OF SOME SUBSTANCES CARRIED BY SHIPS. *Mar. Pollut. Bull.* 14(6):213-214. June 1983. SFA 28(3)

[Natl. Swed. Environ. Prot. Bd., Brackish Water Toxicol. Lab., Studsvik, S611 82 Nyköping, Sweden] At the request of the International Maritime Organization (IMO), our laboratory has performed acute toxicity testing with 43 substances, for which insufficient or no data had been available for hazard rating concerning damage to marine living resources.

83-001880 Bitton, G. BACTERIAL AND BIOCHEMICAL TESTS FOR ASSESSING CHEMICAL TOXICITY IN THE AQUATIC ENVIRONMENT: A REVIEW. *Crit. Rev. Environ. Control.* 13(1):51-67. 1983. SFA 28(3)

[Dep. Environ. Eng. Sci., Univ. Fla., Gainesville.]

83-001881 Brown, D. J. A. EFFECT OF CALCIUM AND ALUMINUM CONCENTRATIONS ON THE SURVIVAL OF BROWN TROUT (*SALMO TRUTTA*) AT LOW pH. *Bull. Environ. Contam. Toxicol.* 30(5):582-587. May 1983. SFA 28(3)

[C.E.R.L. Freshwater Biol. Unit, Midlands Reg. Sci. Serv. Dep., Ratcliffe-on-Soar, Nottingham, NG11 0EE, England]

83-001882 Canton, J. H. and R. C. C. Wegman. STUDIES ON THE TOXICITY OF TRIBROMOETHENE, CYCLOHEXENE AND BROMOCYCLOHEXANE TO DIFFERENT FRESHWATER ORGANISMS. *Water Res.* 17(7):743-747. 1983. SFA 28(3)

[Dep. Hydrobiol. Toxicol., Natl. Inst. Publ. Health, 3720 BA Bilthoven, Netherlands]

83-001883 Devlin, E. W. DEVELOPMENTAL STUDIES ON THE FATHEAD MINNOW (*PIMEPHALES PROMEALS* RAF.): I. THE PREHATCHING DEVELOPMENT OF THE FATHEAD MINNOW. II. THE ACUTE EFFECTS OF TOLUENE ON THREE AGE GROUPS OF FATHEAD MINNOWS. III. THE EFFECT OF TOLUENE ON THE PREHATCHING DEVELOPMENT OF THE FATHEAD MINNOW. *Ph.D. dissertation, N. Dak. State Univ.* 183p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(11):3502. May 1983. SFA 28(3)

The 96-hour LC50 (lethal concentraiton for 50% of the population) of toluene on embryos (55-72 mg/1), newly hatched protolarvae (25-36 mg/1), and 30-day old fathead minnows (18-30 mg/1) was determined using a continuous flow minidiluter system. No significant difference (alpha = 0.10) was found between the LC50 for 30-day olds and protolarvae. The LC50's of both the 30-day olds and protolarvae were significantly (alpha = 0.10) less than the values for embryos. A Defoe Multichannel toxicant injector diluter system was used in a 32-day embryo-larval test to establish a LOEC (lowest observed effect concentration) of 6 mg/1 toluene on fathead minnow weight. Toluene's effect on the prehatching development of the fathead minnow was determined by direct observation and histological techniques. Curvature of the embryonic axis, hydration of the pericardial coelom, overall stunted size, retarded growth rate, and a unique migration of the periblast layer are typical responses. The prehatching development of the fathead minnow at 25 C was determined using direct observation of live embryos and light and scanning electron microscopy techniques. Development was divided into 32 stages, each representing a point in time in the developmental continuum. Hatching normally occurred after 120 hours.

83-001884 Dey, A. C.; J. W. Kiceniuk, U. P. Williams; R. A. Khan and J. F. Payne. LONG TERM EXPOSURE OF MARINE FISH TO CRUDE PETROLEUM--I. STUDIES ON LIVER LIPIDS AND FATTY ACIDS IN COD (*GADUS MORHUA*) AND WINTER FLOUNDER

TOXICOLOGY; BIOASSAYS (CONTINUED)

83-001884 CONTINUED *(PSEUDOPLEURONECTES AMERICANUS). Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 75(1):93-101. 1983. SFA 28(3)
[Northwest Atl. Fish. Cent., P.O. Box 5667, St. John's, NF A1C 5X1, Canada] Total lipids, total phospholipids, lipid class and fatty acids have been studied in the livers of cod and winter flounder from the Northwest Atlantic following long-term exposure to crude petroleum. The levels of free fatty acids and total phospholipids were elevated and triglycerides depleted significantly in the males and females of both species in the experimental groups. The essential fatty acids of $C_{20\ 5}$, $C_{22\ 5}$ and $C_{22\ 6}$ series were significantly altered in the oil exposed animals. These findings indicate that marine fish, following long-term exposure to crude petroleum, tend to (a) use up their stored energy of neutral lipids and (b) develop changes in membrane structure and function.

83-001885 Dutta, H. M.; S. B. Lall and A. Z. Haghighi. METHYL MERCURY INDUCED CHANGES IN THE SERUM PROTEINS OF BLUEGILLS--*LEPOMIS MACROCHIRUS* (TELEOSTEI). *OHIO J. SCI.* 83(3):119-122. June 1983. SFA 28(3)
[Dep. Biol. Sci., Kent State Univ., Kent, OH 44242] There were qualitative and quantitative changes in the serum proteins of bluegills, *Lepomis macrochirus*, exposed to 8.728 X 10^{-4}ppb(W/V) of methyl mercury (MeHg) for 24, 48, and 72 hr. Sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) of serum proteins revealed significant changes in the qualitative and quantitative profiles at 24 and 48 hr. However, at 72 hr a trend to return to control levels was noted. The data suggest that at the dose tested, MeHg produced repairable lesions in certain tissues or organs of bluegills.

83-001886 Eaton, J. G.; V. R. Mattson; L. H. Mueller and D. K. Tanner. EFFECTS OF SUSPENDED CLAY ON BIOCONCENTRATION OF KELTHANE IN FATHEAD MINNOWS. *Arch. Environ. Contam. Toxicol.* 12(4):439-445. July 1983. SFA 28(3)
[U.S. EPA, 6201 Congdon Blvd., Duluth, MN 55804] The experiment was designed to determine the effect of suspended clay sediments on the bioconcentration of the chlorinated hydrocarbon pesticides Kelthane® (dicofol, 4-chloro-α-(4-chlorophenyl)-α-(trichloromethyl) benzene methanol) in fathead minnows (*Pimephales promelas*). The test was carried out under continuous-flow conditions with a modified Mount-Brungs toxicant dilution apparatus and an exposure period of 28 days. Two known safe Kelthane® treatment levels were tested in both filtered lake water and lake water containing aproximately 65mg/L of clay particles. The clay sediments decreased bioconcentration in fathead minnows by 35% indicating that the 30+% of total Kelthane® sorbed onto clay was biologically unavailable to the fish. Bioconcentration factors at the two Kelthane® concentrations were not significantly different. Steady-state concentrations were estimated to occur in 39 to 60 days of exposure at 9,500 to 18,900 times water levels.

83-001887 European Inland Fisheries Advisory Commission. REVISED REPORT ON FISH TOXICITY TESTING PROCEDURES. EIFAC Tech. Pap. No. 24(Rev. 1) vii + 37p. 1983. SFA 28(3)
[FAO of the UN, Rome, Italy]

83-001888 Franklin, F. and R. Lloyd. THE TOXICITY OF TWENTY-FIVE OILS IN RELATION TO MAFF DISPERSANT TESTS. *Fish. Res. Tech. Rep. Minist. Agric. Fish. Food (Lowestoft)* No. 70. 13p. 1982. SFA 28(3)
[Fish Lab., Burnham-on-Crouch, U.K.]

TOXICOLOGY; BIOASSAYS (CONTINUED)

83-001889 Helliwell, S.; G. E. Batley; T. M. Florence and B. G. Lumsden. SPECIATION AND TOXICITY OF ALUMINIUM IN A MODEL FRESH WATER. *Environ. Technol. Lett.* 4(3):141-144. Mar. 1983. SFA 28(3)
[Riverina Coll. Adv. Educ., Wagga Wagga, N.S.W., Australia, 2650] A new algal assay technique was used to determine the effect of the chemical form of aluminium on toxicity in a synthetic hard water. Maximum toxicity occurred at pH 5.8 to 6.2, where as little as 5 μgL^{-1} of labile aluminium significantly inhibited algal growth. Algal assay and computer modelling results implicate $Al(OH)_2^+$ as the aluminium species most toxic to algae.

83-001890 Henderson, R. J. and J. R. Sargent. STUDIES ON THE EFFECTS OF DI-(2-ETHYLHEXYL) PHTHALATE ON LIPID METABOLISM IN RAINBOW TROUT (*SALMO GAIRDNERII*) FED ZOOPLANKTON RICH IN WAX ESTERS. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 74(2):325-330. 1983. SFA 28(3)
[Nat. Environ. Res. Counc., Inst. Mar. Biochem., St. Fitticks Rd., Aberdeen AB1 3RA, Scotland]

83-001891 Holdway, D. A.; J. B. Sprague and J. G. Dick. BIOCONCENTRATION OF VANADIUM IN AMERICAN FLAGFISH OVER ONE REPRODUCTIVE CYCLE. *Water Res.* 17(8):937-941. 1983. SFA 28(3)
[Dep. Zool., Coll Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

83-001892 Ilan, Z. and Z. Yaron. INTERFERENCE OF o,p'DDD WITH INTERRENAL FUNCTION AND CORTISOL METABOLISM IN *SAROTHERODON AUREUS* (STEINDACHNER). *J. Fish Biol.* 22(6):657-669. June 1983. SFA 28(3)
[Dep. Zool., Geo. S. Wise Fac. Life Sci., Tel Aviv Univ., Israel]

83-001893 Kehoe, D. M. EFFECTS OF GRAYS HARBOR ESTUARY SEDIMENT ON THE OSMOREGULATORY ABILITY OF COHO SALMON SMOLTS *(ONCORHYNCHUS KISUTCH). Bull. Environ. Contam. Toxicol.* 30(5):522-529. May 1983. SFA 28(3)
[Environ. Resour. Stn., U.S. Army Corps Eng., P.O. Box C-3755, Seattle, WA 98124]

83-001894 Klaverkamp, J. F.; W. A. Macdonald; W. R. Lillie and A. Lutz. JOINT TOXICITY OF MERCURY AND SELENIUM IN SALMONID EGGS. *Arch. Environ. Contam. Toxicol.* 12(4):415-419. July 1983. SFA 28(3)
[Freshwater Inst., 501 University Crescent, Winnipeg, MB R3T 2N6, Canada] Toxic interactions between mercury and selenium in fertilized eggs of rainbow trout (*Salmo gairdneri*) and lake trout (*Salvelinus namaycush*) were investigated and compared to the pronounced synergistic effect previously reported in carp (*Cyprinus carpio*) eggs. Mercury produced concentration-dependent decreases in median survival times and caused decreases in median hatch times. Selenium, at concentrations up to 10 mg Se/L, had no effect on hatching times, and did not produce mortality, and had no effect on mercury toxicity. At concentrations of 100 mg Se/L and higher, an apparent protective effect of selenium on mercury toxicity was observed in lake trout eggs. Requirements for additional research are discussed with emphasis on predictions of region-wide damage to freshwater fish populations due to atmospheric deposition of these chemical elements.

83-001895 Klaverkamp, J. F.; D. A. Hodgins and A. Lutz. SELENITE TOXICITY AND MERCURY-SELENIUM INTERACTIONS IN JUVENILE FISH. *Arch. Environ. Contam. Toxicol.* 12(4):405-413. July 1983. SFA 28(3)

TOXICOLOGY; BIOASSAYS (CONTINUED)

83-001895 CONTINUED
[Freshwater Inst., 501 University Crescent, Winnipeg, MB R3T 2N6, Canada] Acute lethal toxicities of selenium and the effects of selenium on mercury accumlation were determined in freshwater fish species. Selenite concentrations required to produce 50% mortality were approximately 11 mg SeL in northern pike (*Esox lucius*), 29 mg Se/L in white sucker (*Catostomus commersoni*), and *mg Se/L in yellow perch (Perca flavescens*) after 75, 96, and 240 hr of exposure, respectively. Two approaches were used to determine effects of water-borne selenium on mercury concentrations in northern pike. In the first, a trend of reduced mercury concentrations in northern pike. In the first, a trend of reduced mercury contamination at a low selenium concentration (1 ugSe/L) with maintenance at control mercury contamination levels at a higher selenium concentration (100 µgSe/L) was apparent. In the second, a similar response of decreased CH^3Hg accumulation in muscle-skin at lower selenium concentrations (1 and 10 µg Se/L), but maintenance at control accumulation levels at a higher selenium concentration (100 *Mg* Se/L) was observed. Results and knowledge requirements are discussed with emphasis on relevance to increasing deposition rates of these chemical elements to freshwater ecosystems and using selenium to treat mercury-contaminated aquatic systems.

83-001896 Kpekata, A. E. ACUTE TOXICITY OF 0,0'-(THIO-DI-4, 1-PHENYLENE) BIS(O,O-DIMETHYL PHOSPHOROTHIOATE) (TEMEPHOS) TO *LEBISTES RETICULATUS* AND *SAROTHERODON GALILAEA*. *Bull. Environ. Contam. Toxicol.* 31(1):120-124. July 1983. SFA 28(3)
[Inst. Aquatic Biol., Achimota, Ghana]

83-001897 Latendresse, J. R. II and J. W. Fisher. HISTOPATHOLOGIC EFFECTS OF JP-4 AVIATION FUEL ON FATHEAD MINNOWS *(PIMEPHALES PROMELAS). Bull. Environ. Contam. Toxicol.* 30(5):536-543. May 1983. SFA 28(3)
[Toxic Hazards Div., Air Force Aerospace Med. Res. Lab., Wright-Patterson Air Force Base, OH 45433]

83-001898 Layiwola, P. J.; D. F. C. Linnecar and B. Knights. THE BIOTRANSFORMATION OF THREE ^{14}C-LABELLED PHENOLIC COMPOUNDS IN TWELVE SPECIES OF FRESHWATER FISH. *Xenobiotica* 13(2):107-113. Feb. 1983. SFA 28(3)
[Div. Sci., Polytech. Cent. London, 115 New Cavendish St., London W1M 8JS, England]

83-001899 Lewis, M. A. and V. T. Wee. AQUATIC SAFETY ASSESSMENT FOR CATIONIC SURFACTANTS. *Environ. Toxicol. Chem.* 2(1):105-118. 1983. SFA 28(3)
[Environ. Safety Dep., Procter & Gambel Co., Cincinnati, OH 45217]

83-001900 Linder, G. and H. Bergman. PERIODIC DEPURATION OF ANTHRACENE METABOLITIES IN RAINBOW TROUT. *J. Colo.-Wyo. Acad. Sci.* 14(1):14-15. Apr. 1982. Abstract only. SFA 28(3)
[Dep. Biol., Univ. Wyo., Laramie] The bioconcentration of polynuclear aromatic hydrocarbons (PAH) by rainbow trout (*Salmo gairdneri*) has been well documented over the last twenty years. Yet we are aware of no reports describing the periodic depuration of PAH metabolites. But here we report the periodic depuration of ^{14}C-labeled metabolites of 9-^{14}C-anthracene following the bioconcentration of parent compound in

TOXICOLOGY; BIOASSAYS (CONTINUED)

83-001900 CONTINUED rainbow trout. We exposed rainbow trout to 1.0 ppm anthracene including 9-^{14}C-anthracene (10 µCi), and after 18-hr. static exposures body burdens of ^{14}C-labeled compound increased to nonequilibrium bioconcentration factors of approximately 200. Then in static-replacement aquaria, depuration of anthracene metabolite was followed in water samples and rainbow trout tissue extractions. The results clearly demonstrate that anthracene is quickly converted to more polar metabolites, with metabolite depuration characterised by maxima between midnight and 0800 hours and minima between 0800 and 1600 hours. While more work must be performed to warrant classification as a circadian rhythm, the results clearly represent a periodic function to be considered in sampling designs for studies of uptake and depuration of PAH by fish.

83-001901 McKim, J. M. and E. M. Heath. DOSE DETERMINATIONS OF WATERBORNE 2,5,2',5'-[^{14}C]TETRACHLOROBIPHENYL AND RELATED PHARMACOKINETICS IN TWO SPECIES OF TROUT (*SALMO GAIRDNERI* AND *SALVELINUS FONTINALIS*): A MASS-BALANCE APPROACH. *Toxicol. Appl. Pharmacol.* 68(2):177-187. Apr. 1983. SFA 28(3)
[U.S. EPA, 6201 Congdon Blvd., Duluth, MN 55804]

83-001902 Medeiros, C.; R. LeBlanc and R. A. Coler. AN *IN SITU* ASSESSMENT OF THE ACUTE TOXICITY OF URBAN RUNOFF TO BENTHIC MACROINVERTEBRATES. *Environ. Toxicol. Chem.* 2(1):119-126. 1983. SFA 28(3)
[R.A. Coler: Dep. Environ. Sci., Univ. Mass., Amherst 01003] Colonized Hester-Dendy substrates were deployed for 96 h in an urban river reach, storm drain channel and a control site to assess the toxicity of urban runoff. The mean macroinvertebrate diversity during rain events was reduced from 1.7 at the control station to 1.0 at both urban stations. Snowmelt exerted the same effect on river substrate diversity, but only reduced channel values from 2.0 to 1.4. During periods of no runoff, however, mean channel and control diversities remain the same, while river values dropped to 0.8. Similarly, substrate population densities during rain were, respectively, two and seven times more limiting for the storm drain channel and river reach stations. The same trend was evident in heavy metals uptake, indicating that dry weather toxicity in urban river reaches originates from the sediments. Runoff, then, serves to reduce toxicity during input, but increases it over the long run.

83-001903 Muramoto, S. ELIMINATION OF COPPER FROM Cu-CONTAMINATED FISH BY LONG-TERM EXPOSURE TO EDTA AND FRESH WATER. *J. Environ. Sci. Health A Environ. Sci. Eng. (Marcel Delker, Inc., N.Y.)* 18(3):455-461. 1983. SFA 28(3)
[Inst. Agric. Biol. Sci., Okayama Univ., Kurashiki 710, Japan]

83-001904 Nagel, R. and K. Urich. QUINOL SULPHATE, A NEW CONJUGATE OF PHENOL IN GOLDFISH. *Xenobiotica* 13(2):97-100. Feb. 1983. SFA 28(3)
[Dep. Zool., Johannes-Gutenberg Univ., Mainz, Saarstr. 21, D-6500 Mainz, West Germany]

83-001905 Nagel, R. SPECIES DIFFERENCES, INFLUENCE OF DOSE AND APPLICATION ON BIOTRANSFORMATION ON PHENOL IN FISH. *Xenobiotica* 13(2):101-106. Feb. 1983. SFA 28(3)
[Dep. Zool., Johannes-Gutenberg Univ., Mainz, Saarstr. 21, D-6500 Mainz, West Germany]

TOXICOLOGY; BIOASSAYS (CONTINUED)

83-001906 Nebeker, A. V.; C. K. McAuliffe; R. Mshar and D. G. Stevens. TOXICITY OF SILVER TO STEELHEAD AND RAINBOW TROUT, FATHEAD MINNOWS AND *DAPHNIA MAGNA*. *Environ. Toxicol. Chem.* 2(1):95-104. 1983. SFA 28(3)

[U.S. EPA, Corvallis Environ. Res. Lab., Corvallis, OR 97333] Rainbow (*Salmo gairdneri*) and steelhead (*Salmo gairdneri*) trout and fathead minnows (*Pimephales promelas*) were exposed to silver for 96 h in replicated flow-through tests. Rainbow trout, fathead minnows and *Daphnia magna* were exposed to silver in replicated static acute tests. Steelhead trout embryo-larval stages were tested in a flow-through system for 60 d, and *D. magna* were exposed through complete life cycles in replicated static-renewal tests. All silver concentrations were measured values. No differences were seen between flow-through and static LC_{50} values. Rainbow trout 96-h flow-through LC_{50} values were 8.6 and 9.7µg/L silver; static values were 10.9 and 8.5µg/L. The 96-h LC_{50} for steelhead trout in the flow-through test was 9.2µg/L. Fathead minnow 96-h flow-through LC_{50} values were 5.6 and 7.4µg/L silver; static values were 9.4 and 9.7 µg/L. The absence of food in static tests with *D. magna* caused silver to be about 10 times more toxic; the 48-h static mean EC_{50} value for *D. magna* without food was 0.9µg/L, compared to 12.5µg/L in the test with food. The early-life stage test with steelhead trout, from newly fertilized eggs to post-swimup juveniles, showed complete mortality at 1.3 µg/L and significant reduction in fish survival at 0.5 µg/L silver. Mean weight and length at end of test were greatly reduced at 1.1 µg/L, and were significantly different from controls at 0.1 µg/L. The mean 21-d EC_{50} value for the *D. magna* test with food was 3.5 µg/L. The 21-d lowest significant (α = 0.05) effect on survival occurred at 4.1 µg/L. The mean silver concentration at which there was a significant decrease in total *Daphnia* young/female/day after 21 d, compared to the control was 10.5µg/L silver.

83-001907 Ogilvie, D. M. and D. M. Stechey. EFFECTS OF ALUMINUM ON RESPIRATORY RESPONSES AND SPONTANEOUS ACTIVITY OF RAINBOW TROUT, *SALMO GAIRDNERI*. *Environ. Toxicol. Chem.* 2(1):43-48. 1983. SFA 28(3)

[Dep. Zool., Univ. West. Ontario, London N6A 5B7, Canada] Respiratory responses of juvenile rainbow trout, *Salmo gairdneri* Richardson, were determined after approximately 26 h of exposure to dechlorinated tap water (at pH 6.0) containing 50, 100, 200 or 500 µg/L of added aluminum. Aluminum exposure produced significant increases in both opercular rate and cough frequency. Changes in the cough rates were proportional to the aluminum level, and the threshold concentration was approximately 100 µg/L. In addition, spontaneous locomotor activity was reduced by aluminum exposure.

83-001908 Palawski, D.; D. R. Buckler and F. L. Mayer. SURVIVAL AND CONDITION OF RAINBOW TROUT (*SALMO GAIRDNERI*) AFTER ACUTE EXPOSURES TO METHYL PARATHION, TRIPHENYL PHOSPHATE, AND DEF. *Bull. Environ. Contam. Toxicol.* 30(5):614-620. May 1983. SFA 28(3)

[Columbia Natl. Fish. Res. Lab., Rt. 1, Columbia, MO 65201]

83-001909 Saroglia, M. G.; G. Scarano and E. Tibaldi. ACUTE TOXICITY OF NITRITE TO SEA BASS (*DICENTRARCHUS LABRAX*) AND EUROPEAN EEL (*ANGUILLA ANGUILLA*). *J. World Maricult. Soc.* 12(2):121-126. 1981. SFA 28(3)

TOXICOLOGY; BIOASSAYS (CONTINUED)

[ENEL-CRTN, Via Rubattino 54, 20100 Milano, Italy] Static acute toxicity tests of 4 and 7 days duration were performed on sea bass (*Dicentrarchus labrax*) and European eel (*Anguilla anguilla*). The 96-hour LC_{50} for sea bass ($\bar{X}$=5 cm) was 274, 220, and 154 mg/liter $N\text{-}NO_2$ at water temperatures of 17, 23 and 27°C, respectively, in sea water. The 96-hour LC_{50} for eel elvers was 84, 213, 264, 503, 812 and 974 at salinities of 0, 6, 12, 24, 30 and 36 g/liter.

83-001910 Shah, P. H. and M. S. Dubale. RETENTION OF CADMIUM IN A FRESHWATER FISH, *CHANNA PUNCTATUS*. *Experientia (Basel)* 39(5):522-523. 15 May 1983. SFA 28(3)
[Zool. Dep., Univ. Sch. Sci., Gujarat Univ., Ahmedabod-380 009, India] The study revealed a significant retention of cadmium in the liver and kidney of *Channa punctatus* exposed to various concentrations of cadmium. A linear relationship was observed between the period of exposure, the cadmium level in the medium and its retention in the target organs except for a slight decline in the quantity of cadmium in the liver when exposed to 0.01 ppm concentration.

83-001911 Simon, L. M.; J. Nemcsók and L. Boross. STUDIES ON THE EFFECT OF PARAQUAT ON GLYCOGEN MOBILIZATION IN LIVER OF COMMON CARP (*CYPRINUS CARPIO* L.). *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 75(1):167-169. 1983. SFA 28(3)
[Dep. Biochem., Attila József Univ., Szeged, P.O. Box 533, H-6701 Hungary] A herbicide, paraquat (1,1'dimethyl-4,4'-bipyridilium-dichloride) was administered to carp in 0.5-10.0 ppm concentrations, respectively, and blood sugar level, glucose-6-phosphatase and glycogen phosphorylase activities of liver were determined. Paraquat treatment caused an increase of blood sugar level and enhanced phosphorylase and glucose-6-phosphatase activities. Paraquat can induce alterations in endoplasmic reticulum that might contribute to the changes in glucose-6-phosphatase activity, resulting in an increase of blood glucose level and/or all the effects can be attributed to a high level of circulating epinephrine produced by paraquat toxicosis.

83-001912 Sinhaseni, P.; L. G. D'Alecy; R. Hartung and M. Shlafer. RESPIRATORY EFFECTS OF HEXACHLOROCYCLOPENTADIENE ON INTACT RAINBOW TROUT (*SALMO GAIRDNERI*) AND ON OXIDATIVE PHOSPHORYLATION OF ISOLATED TROUT HEART MITOCHONDRIA. *Toxicol. Appl. Pharmacol.* 67(2):215-223. Feb. 1983. SFA 28(3)
[M. Shlafer: Dep. Pharmacol., Univ. Mich. Med. Sch., Ann Arbor 48109]

83-001913 Storozhuk, N. G. and B. P. Smirnov. EFFECT OF MERCURY ON THE RESPIRATION RATE OF LARVAL PINK SALMON, *ONCORHYNCHUS GORBUSCHA*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(5):168-171. 1982. SFA 28(3)
[VNIRO, Moscow, USSR]

83-001914 Tikhonova, L. S. and I. A. Shekhanova. EFFECT OF PESTICIDES ON RUSSIAN STURGEON, *ACIPENSER GUELDENSTAEDTI* (ACIPENSERIDAE), IN THE EMBRYONIC-LARVAL PERIOD. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(5):172-175. 1982. SFA 28(3)
[VNIRO, Moscow, USSR]

83-001915 Truscott, B.; J. M. Walsh; M. P. Burton; J. F. Payne and D. R. Idler. EFFECT OF ACUTE EXPOSURE TO CRUDE PETROLEUM ON SOME REPRODUCTIVE HORMONES IN SALMON AND FLOUNDER. *Comp. Biochem. Physiol. C Comp. Pharmacol.*

TOXICOLOGY; BIOASSAYS (CONTINUED)

83-001915 CONTINUED *Toxicol.* 75(1):121-130. 1983. SFA 28(3)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada] The concentration of total (free + conjugated) androgens in plasma of sexually mature male salmon and flounder was generally lower in oil-exposed fish. Exposure to crude oil inhibited some testicular development of salmon during the final stages of maturation. Oil exposure had no effect on levels of total plasmatic androgens or estradiol in male and female flounder during gonadal recrudescence. Aryl hydrocarbon hydroxylase activity increased in liver and kidney of both species. Sperm, collected from salmon exposed to oil, fertilized eggs from non-exposed females to produce normal alevins.

83-001916 Tucker, C. S. and T. E. Schwedler. ACCLIMATION OF CHANNEL CATFISH (*ICTALURUS PUNCTATUS*) TO NITRITE. *Bull. Environ. Contam. Toxicol.* 30(5):516-521. May 1983. SFA 28(3)
[Miss. Agric. For. Exp. Stn., Stoneville, MS 38776]

83-001917 Waiwood, B. A. and K. Haya. LEVELS OF CHORIONASE ACTIVITY DURING EMBRYONIC DEVELOPMENT OF *SALMO SALAR* UNDER ACID CONDITIONS. *Bull. Environ. Contam. Toxicol.* 30(5):511-515. May 1983. SFA 28(3)
[Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

RESEARCH AND MANAGEMENT-GENERAL

83-001918 Fritz, E. S. FISHERIES SCIENCE IN THE NATIONAL SEA GRANT COLLEGE PROGRAM. *Fisheries (Bull. Am. Fish. Soc.)* 8(2):11-15. Mar.-Apr. 1983.

83-001919 Huner, J. V. THE NORTHERN PIKE - A COSMOPOLITAN SPECIES. *Farm Pond Harvest* 17(3):12-14, 29. 1983. SFA 28(3)
[Dep. Appl. Zool., Univ. Kuopio, P.O.B. 138, SF-70101 Kuopio 10, Finland]

83-001920 Regier, H. A. TRAINING COURSE ON THE MANAGEMENT OF SMALL-SCALE FISHERIES IN THE INLAND WATERS OF AFRICA: CONCEPTUAL FRAMEWORK AND APPROACHES FOR THE ACQUISITION OF KEY RESOURCE INFORMATON. *FAO Fish. Circ.* No. 752. v + 25p. Dec. 1982. SFA 28(3)
[Univ. Toronto, Toronto, ON, Canada]

83-001921 Wisconsin Department of Natural Resources. SPECIAL FISH MANAGEMENT ISSUE. *Wis. Nat. Resour.* 7(3):1-55. May-June 1983. SFA 28(3)
A collection of popular articles on fishery research and management in Wisconsin.--RS.

REPORTS OF FISHERY STATIONS, STATES, ETC.

83-001922 Fiji Ministry of Agriculture and Fisheries. FISHERIES DIVISION ANNUAL REPORT. *Fiji Minist. Agric. Fish. Fish. Div. Annu. Rep.* 91p. 1982. SFA 28(3)
[Suva, Fiji]

REPORTS OF FISHERY STATIONS, STATES, ETC. (CONTINUED)

83-001923 Pacific Marine Fisheries Commission. 35th ANNUAL REPORT OF THE PACIFIC MARINE FISHERIES COMMISSION FOR THE YEAR 1982. *Pac. Mar. Fish. Comm. Annu. Rep.* 35:45p. 1 June, 1983. SFA 28(3)
[528 S.W. Mill St., Portland, OR 97201]

HABITAT ALTERATIONS

83-001924 Harville, J. P. OBSOLETE PETROLEUM PLATFORMS AS ARTIFICIAL REEFS. *Fisheries (Bull. Am. Fish. Soc.)* 8(2):4-6. Mar.-Apr. 1983. SFA 28(3)
[Pac. Mar. Fish. Comm., Portland, OR]

83-001925 LaBounty, J. F. and J. J. Sartoris. EFFECTS OF OPERATING THE MT. ELBERT PUMPED-STORAGE POWERPLANT ON TWIN LAKES, COLORADO: 1981 REPORT OF FINDINGS. *U.S. Dep. Interior Bur. Reclam.* REC-ERC-83-2. v + 88p. Dec. 1982. SFA 28(3)
[Bur. Reclam., Div. Res., Eng. Res. Cent., Denver, CO]

83-001926 Okamoto, M. [DIURNAL-NOCTURNAL ACTIVITY OF FISHES NEAR THE ARTIFICIAL SEAWEEDS FARM PLANT (EXPERIMENTAL FLOATING REEF).] *Bull. Jpn. Soc. Sci. Fish.* 49(2):177-182. Feb. 1983. In Japanese with English summ. SFA 28(3)
[Jpn. Mar. Sci. Technol. Cent., Natsushima, Yokosuka 237, Japan] Artificial seaweeds farm plant, experimental floating reef make of steel, had been anchored at the depth of fourty-three meters off Tajima in the Japan Sea. Mean component of the plant was a shelf (22X22m square) settled at ten meter depth layer and an observation tower rose at the center of the shelf toward the surface. Two years after the plant had been anchored, the activity of fishes around the plant was investigated by direct observation and by some automatic recording intruments. As results, some phenomena concerning the behavior of fishes were found as follows: (1) Around the plant, seventeen kinds of fishes were found and the dominants were *Seriola aureovittata*, *Oplegnathus fasciatus*, *Sebastes inermis* and *Navodon modestus*. (2) Distribution and activity of the fishes around the plant varied in the daytime and in the nightime. (3) Fishes were classified into all day dependant type and daytime dependant type to the plant, but this classification seemed to vary according to the life-stage of each kind of fishes. (4) Most of the fishes, including young *Navodon modestus*, belonged to all day dependant type, and they distributed within twenty meters of the plant horizontally and vertically, all day. (5) *Seriola aureovittata* and adult *Navodon modestus* belonged to daytime dependant type, and they distributed thirty meters or more from the plant, in the daytime. In the nighttime, they were not observed swimming around the plant, and *Navodon modestus* was considered to rest on the bottom under the plant.

83-001927 Pennington, C. H.; J. A. Baker and M. E. Potter. FISH POPULATIONS ALONG NATURAL AND REVETTED BANKS ON THE LOWER MISSISSIPPI RIVER. *N. Am. J. Fish. Manage.* 3(2):204-211. 1983. SFA 28(3)
[U.S. Army Eng. Waterways Exp. Stn., P.O. Box 631, Vicksburg, MS 39180]

83-001928 Robinson, J. L.; M. A. Smith and Q. D. Skinner. THE WYOMING RANGE STREAM INVENTORY - A METHOD FOR RIPARIAN HABITAT MANAGEMENT. *J. Colo.-Wyo. Acad. Sci.* 14(1):18. Apr. 1982. Abstract only. SFA 28(3)

HABITAT ALTERATIONS (CONTINUED)

83-001928 CONTINUED
[Dep. Biol., Univ. Wyo., Laramie] Over the past two decades the riparian ecosystem has become an area of major controversy. Excessive use from domestic livestock, mining, recreation, etc. has resulted in stream channel degradation, reduced water quality, and a decline in fish population. Degradation generally progresses from a change in riparian user rate to change in water quality to change in fish populations. A change in vegetation composition occurs over a period concurrent with stream conditions. Presently the two methods utilized to monitor impacts or improvements to the riparian ecosystem are: (1) vegetative sampling to monitor species composition change and/or (2) electrofishing or chemical capture to monitor fish populations. The Wyoming Range Stream Inventory (WRSI) method utilizes quantitative measures of stream morphological characteristics. This permits detection of change at a much earlier stage. Data analysis has shown this method to be sensitive to alterations and improvements in channel equilibrium. On a test area in western Wyoming the WRSI method provided data indicating significant improvements in channel morphology on Little Muddy Creek after one year inside an exclosure. This approach will permit managers to detect early change and rectify undesirable changes in streams and to monitor the effectiveness of management efforts.

83-001929 Silsbee, D. G. and G. L. Larson. A COMPARISON OF STREAMS IN LOGGED AND UNLOGGED AREAS OF GREAT SMOKEY MOUNTAINS NATIONAL PARK. *Hydrobiologia* 102(2):99-111. 3 June 1983. SFA 28(3)
[NPS, Great Smokey Mtn. Natl. Park, Twin Creeks Area, Gatlinburg, TN 37738] Second order streams draining areas of virgin forest in Great Smoky Mountains National Park, Tennessee and North Carolina, U.S.A., are compared to those which drain forests logged before the establishment of the park in the 1930's. Water quality of two main study streams (one unlogged and one formerly logged) was compared and the unlogged stream had generally higher levels of dissolved solids and lower levels of suspended particulates than the logged stream. Stream channel characteristics were compared on four logged and four unlogged streams. The unlogged streams had over four times more (by volume) of woody debris and 10 times more material in debris dams than the logged streams. Only minor differences in substrate composition were observed. Macroinvertebrate samples from the four logged and four unlogged streams showed that the logged streams contained greater numbers of organisms and more taxa. More detailed sampling on the two main study streams showed similar patterns of moré individuals and more taxa in the logged streams, as well as differences in the composition of five functional groups. These differences in invertebrate fauna may be due to differences in quantity and quality of leaf litter inputs, although other explanations are also possible.

83-001930 Swink, W. D. and K. E. Jacobs. INFLUENCE OF A KENTUCKY FLOOD-CONTROL RESERVOIR ON THE TAILWATER AND HEADWATER FISH POPULATIONS. *N. Am. J. Fish. Manage.* 3(2):197-203. 1983. SFA 28(3)
[U.S. FWS, East Cent. Reservoir Invest., Bowling Green, KY 42101]

83-001931 Tschaplinski, P. J. and G. F. Hartman. WINTER DISTRIBUTION OF JUVENILE COHO SALMON (*ONCORHYNCHUS KISUTCH*) BEFORE AND AFTER LOGGING IN CARNATION CREEK, BRITISH COLUMBIA, AND SOME IMPLICATIONS FOR OVERWINTER SURVIVAL. *Can. J. Fish. Aquatic Sci.* 40(4):452-461. Apr. 1983. In English with French summ. SFA 28(3)
[Dep. Biol., Univ. Victoria, Victoria, BC V8W 2Y2, Canada]

83-001932 Wadia, W. EFFECT OF REGULATION OF THE NILE RIVER ON THE BIOPRODUCTIVITY OF SOUTHEASTERN MEDITERRANEAN SEA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(5):164-167. 1982. SFA 28(3)
[VNIRO, Moscow, USSR]

HARVEST, CREEL CENSUS, ETC.

83-001933 McBride, D. N. and J. A. Wilcock, (eds.). ALASKA CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA* WALBAUM) CATCH AND ESCAPEMENT, 1961-1980, WITH AGE, SIZE, AND SEX COMPOSITION ESTIMATES. *Alaska Dep. Fish Game Inf. Leafl.* No. 212. x + 181p. Apr. 1983. SFA 28(3)
[Alaska Dep. Fish Game, Div. Commer. Fish., Anchorage]

REGULATIONS

83-001934 FAO of the UN. REPORTS OF THE FOURTH SESSION OF THE COMMITTEE ON RESOURCE MANAGEMENT, ROME, 17-18 JUNE 1982, AND THE TECHNICAL CONSULTATION ON REGULATION OF EFFORT IN TRAWL FISHERIES IN THE MEDITERRANEAN. *FAO Fish. Rep.* No. 270. vi + 83p. 1982. In French and English. SFA 28(3)
[Rome, Italy]

83-001935 Slivka, A. P. and A. V. Pavlov. THE BIOLOGICAL BASES FOR CHANGING STURGEON (ACIPENSERIDAE) FISHERY REGULATIONS IN THE VOLGA DELTA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(5):33-41. 1982. SFA 28(3)
[TsNIORKh, Astrakhan, USSR]

MARKING AND TAGGING

83-001936 Green, A. W.; G. C. Matlock and J. E. Weaver. A METHOD FOR DIRECTLY ESTIMATING THE TAG-REPORTING RATE OF ANGLERS. *Trans. Am. Fish. Soc.* 112(3):412-415. May 1983. SFA 28(3)
[Tex. Parks Wildl. Dep., 4200 Smith School Rd., Austin 78744]

83-001937 Michel, C; T. Helas; N. Dalimier and J. Voss. IDENTIFICATION INDIVIDUELLE DES POISSONS EN MILIEU NATURAL SANS RECOURS AU MARQ'AGE. [IDENTIFICATION OF INDIVIDUAL FISH IN FIELD STUDIES WITHOUT USING MARKING.] *Ann. Inst. Oceanogr. Nouv. Ser.* 59(1):57-64. 1983. In French with English summ. SFA 28(3)
[Serv. Ethol. Psychol. Anim., Univ. Liége, quai Van Beneden, 22-B-4020 Liége, Belgium] An ethological study on fishes often requires an identification of each individual of the group considered. Artificial marking is very difficult or even impossible. Some colour pattern characteristics can however be used. Thus, in our studies on social wrasses behaviour, Grey wrasses (*Symphodus (C.) cinereus*) and Five-spotted wrasses (*Symphodus (C.) roissali*) are identified respectively by the shape of the caudal black spot and the colour and shape of the opercular spots. During a study on the reproduction of Perch (*Perca fluviatilis*), fish were differentiated thanks to the individual characteristics of the transversal black stripes.

STOCKING AND INTRODUCTIONS

83-001938 Bax, N. J. EARLY MARINE MORTALITY OF MARKED JUVENILE CHUM SALMON (*ONCORHYNCHUS KETA*) RELEASED INTO HOOD CANAL, PUGET SOUND, WASHINGTON, IN 1980. *Can. J. Fish. Aquatic Sci.* 40(4):426-435. Apr. 1983.

STOCKING AND INTRODUCTIONS (CONTINUED)

83-001938 CONTINUED In English with French summ. SFA 28(3)
[Fish. Res. Inst., Sch. Fish., Univ. Wash., Seattle 98195]

83-001939 Clark, J. and B. McCarl. AN INVESTIGATION OF THE RELATIONSHIP BETWEEN OREGON COHO SALMON (*ONCORHYNCHUS KISUTCH*) HATCHERY RELEASES AND ADULT PRODUCTION UTILIZING LAW OF THE MINIMUM REGRESSION. *Can. J. Fish. Aquatic Sci.* 40(4):516-523. Apr. 1983. In English with French summ. SFA 28(3)
[Dep. Agric. Resour. Econ., Oreg. State Univ., Corvallis 97331]

83-001940 Conley, J. FISH PLANTING GOES MODERN. *Fisheries (Bull. Am. Fish. Soc.)* 8(3):2-4. May-June 1983. SFA 28(3)

83-001941 Ersbak, K. and B. L. Haase. NUTRITIONAL DEPREVIATION AFTER STOCKING AS A POSSIBLE MECHANISM LEADING TO MORTALITY IN STREAM-STOCKED BROOK TROUT. *N. Am. J. Fish. Manage.* 3(2):142-151. 1983. SFA 28(3)
[Pohoqualine Fish Assoc., R.D. 6, Box 6309, Stroudsburg, PA]

83-001942 FAO of the UN. REPORT OF THE SYMPOSIUM ON STOCK ENHANCEMENT IN THE MANAGEMENT OF FRESHWATER FISHERIES. *EIFAC Tech. Pap.* No. 42. v + 43p. 1982. SFA 28(3)
[Rome, Italy]

83-001943 Fraser, J. M. THE PERFORMANCES OF TWO WILD AND TWO HYBRID STRAINS OF BROOK TROUT PLANTED IN AN INFERTILE, ACIDIC LAKE. *Ont. Fish. Tech. Rep. Ser.* No. 7. iii + 7p. 1983. SFA 28(3)
[Ontario Minist. Nat. Resour., Fish Br., Maple, ON, Canada] Survival, growth and food habits of four strains of brook trout (*Salvelinus fontinalis*) planted simultaneously as fall fingerlings in Crystal Lake, Algonquin Park, Ontario, were remarkably similar. Crystal Lake is acidic (pH ≅5.3), poorly buffered (alkalinity 0.18 mg/litre as $CaCO_3$), and relatively infertile (total dissolved solids 17 mg/litre). All four strains grew rapidly, reaching 800 g in weight at age 3 and 1100-1200 g at age 4. Survival over the two years following planting ranged from 7.7-18.8%. The 7705 fall fingerlings, which collectively weighed 26 kg at planting, were reduced in two years to an estimated 950 fish weighing 447 kg--a standing stock of 12.3 kg/ha. The reduction in numbers was due chiefly to natural mortality, although some illegal angling was reported for this sanctuary lake.

83-001944 Hauber, A. B. TWO METHODS FOR EVALUATING FINGERLING WALLEYE STOCKING SUCCESS AND NATURAL YEAR-CLASS DENSITIES IN SEVEN ISLAND LAKE, WISCONSIN, 1977-1981. *N. Am. J. Fish. Manage.* 3(2):152-155. 1983. SFA 28(3)
[Wis. Dep. Nat. Resour., 5301 Rib Mountain Dr., Wausau 54401]

83-001945 Hudy, M. and C. R. Berry, Jr. PERFORMANCE OF THREE STRAINS OF RAINBOW TROUT IN A UTAH RESERVOIR. *N. Am. J. Fish. Manage.* 3(2):136-141. 1983. SFA 28(3)
[Ga. Coop. Fish. Res. Unit, Univ. Ga., Athens 30602]

STOCKING AND INTRODUCTIONS (CONTINUED)

83-001946 Hulbert, P. J. and R. Engstrom-Heg. UPSTREAM DISPERSAL OF FALL-STOCKED BROWN TROUT IN CANAJOHARIE CREEK, NEW YORK. *N.Y. Fish Game J.* 29(2):166-175. July 1982. SFA 28(3)

[N.Y. State Dep. Environ. Conserv., Stamford, 12167] A large proportion of fall-stocked fingerling brown trout in Canajoharie Creek consistently dispersed upstream within a few days after stocking. Subsequent sampling in the immediate vicinity of the release sites would have given misleadingly low estimates of survival. If this is a general pattern of behavior for fingerling brown trout stocked in the fall, it should be considered in connection with the stocking of these fish and in evaluating their contribution to trout fisheries.

83-001947 Swink, W. D. NONMIGRATORY SALMONIDS AND TAILWATERS--A SURVEY OF STOCKING PRACTICES IN THE UNITED STATES. *Fisheries (Bull. Am. Fish. Soc.)* 8(3):5-9. May-June 1983. SFA 28(3)

83-001948 Washington, P. M., Jr. AN ANALYSIS OF FACTORS AFFECTING THE PRODUCTION OF COHO SALMON (*ONCORHYNCHUS KISUTCH*) IN THE COLUMBIA RIVER. *Ph.D. dissertation, Univ. Wash.* 248p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(10):3125. Apr. 1983. SFA 28(3)

The change in the relationship between numbers of adult coho, and numbers and sizes of yearlings released was investigated. It was hypothesized that the first 6 months after yearlings were released could be broken down into several substanzas. The substanzas were bounded by challenge points. Mortalities among yearlings were the result of various forces which were discrete and discontinuous. The first 6 months after release was established as the period of major mortality among hatchery coho. The challenge point concept was used to break the period up into substanzas. A length-dichotomy method was developed to estimate the survival rate in substanzas between release and saltwater entry. Hatchery pond densities were determined to be a significant factor affecting the survival of coho to adulthood.

FISHING GEAR AND TECHNIQUES

83-001949 Bianchini, M. L.; P. W. Sorensen and H. E. Winn. THE USE OF HORSESHOE CRABS AS EEL BAIT. *J. World Maricult. Soc.* 12(2):127-129. 1981. SFA 28(3)

[C.N.R., P. le Aldo Moro, 7-00188 Rome, Italy]

83-001950 Hoydal, K.; C. J. Røvik and P. Sparre. ESTIMATION OF EFFECTIVE MESH SIZES AND THEIR UTILIZATION IN ASSESSMENT. *Dana* 2:69-95. 1982. SFA 28(3)

[Fiskirannsoknarstovan, Debessartrød, 3800 Torshavn, Faroe Islands] A method to estimate the effective mesh sizes used by different fleets fishing on the same stock is described. The model of the fisheries makes use of the Von Bertalanffy and the traditional Beverton & Holt equations to describe the dynamics of the stock. Logistic curves are used to describe the recruitment of the fish to grounds, the selective properties of the gears and the discard practice. The effective mesh sizes are estimated by minimizing the sume of squares between the estimated and observed relative length or age composition of the landings. The model can be used to estimate the effects on the different fleet's fishing mortalities and catches of changes in the mesh size and effort in one or more fleets etc.

FISHING GEAR AND TECHNIQUES (CONTINUED)

83-001951 Hubert, W. A. and M. B. Sandheinrich. PATTERNS OF VARIATION IN GILL-NET CATCH AND DIET OF YELLOW PERCH IN A STRATIFIED IOWA LAKE. *N. Am. J. Fish. Manage.* 3(2):156-162. 1983. SFA 28(3)
[Wyo. Coop. Fish Wildl. Res. Unit, Box 3166, University Station, Laramie 82071]

83-001952 Hutchison, J. EFFECTS OF LEABURG AND WALTERVILLE POWER CANALS UPON ADJACENT SECTIONS OF THE MCKENZIE RIVER. *Oreg. Dep. Fish. Wildl. Fish Div. Inf. Rep.* 83-4. ii + 10p. Mar. 1983. SFA 28(3)

83-001953 Quimby, A. J. and N. C. Dudiak. AN INTERTIDAL SALMON FRY TRAP. *N. Am. J. Fish. Manage.* 3(2):212-215. 1983. SFA 28(3)
[Alaska Dep. Fish Game, Div. Fish. Rehab. Enhance. Dev., P.O. Box 234, Homer 99603]

FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC.

83-001954 Benda, R. S. DIURNAL MOVEMENT OF FISH LARVAE AND INVERTEBRATES INTO A POWER PLANT INTAKE. *Proc. Indiana Acad. Sci.* 91:601-605. 1981(1982). SFA 28(3)
[Div. Nat. Sci., Aquinas Coll., Grand Rapids, MI 49506]

83-001955 Mosley, M. P. CRITICAL DEPTHS FOR PASSAGE IN BRAIDED RIVERS, CANTERBURY, NEW ZEALAND. *N.Z. J. Mar. Freshwater Res.* 16(3-4):351-357. 1982. SFA 28(3)
[Minist. Works Dev., P.O. Box 1479, Christchurch, New Zealand] Riffles and points of divergence of branch channels in braided rivers are critical controls upon passage of fish and recreational boats because they are points at which depths are at a minimum. Depths on randomly selected riffles were measured in braided reaches of the Ashley, Hurunui, and Rakaia Rivers and related to discharge; minimum depths encountered in extended reaches of these rivers at a range of flows have also been measured. The data can be used to predict minimum available passage depths at a specified flow, or conversely, to predict the discharge required to maintain a specified minimum passage depth. However, presently available estimates of critical minimum depths required for various instream uses (migration of salmonids, jetboating) appear excessively vely conservative, and minimum depth requirmentes must be more accurately determined before instream flow needs can be properly assessed.

83-001956 Turnpenny, A. W. H. MULTIPLE REGRESSION ANALYSIS FOR FORECASTING CRITICAL FISH INFLUXES AT POWER STATION INTAKES. *J. Appl. Ecol.* 20(1):33-42. Apr. 1983. SFA 28(3)
[Mar. Biol. Unit, Cent. Elec. Gen. Bd., Fawley, Hampshire, SO4 ITW, England] Certain coastal power stations in Britain are subject to ingresses of fish which may jeopardize plant operation or which may cause temporary local depletion of fish populations. There have been attempts in the United States and in Europe to develop costly and often ineffectual exclusion devices. As an alternative, it is proposed that, for sites where the problem is intermittent, statistical models should be developed which allow critical levels of fish ingress to be predicted and the necessary reduction in cooling water flow determined. The procedure for developing a multiple regression

FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC. (CONTINUED)

83-001956 CONTINUED model is described and illustrated using fish impingement data collected from Fawley Power Station. Over 60% of the overall variation was accounted for in terms of a small number of easily measured variables (cooling water flow, water temperature, tide height, wind speed). In other research work, values of up to 80% have been quoted. With refinements of the model formulation higher values should be possible and the approach then would have practical application.

MATHEMATICS, STATISTICAL METHODS, AND MODELING

83-001957 Bockstael, N. and J. J. Opaluch. DISCRETE MODELLING OF SUPPLY RESPONSE UNDER UNCERTAINTY: THE CASE OF THE FISHERY. *J. Environ. Econ. Manage.* 10(2):125-137. June 1983. SFA 28(3)
[Univ. Md., College Park 20742]

83-001958 Bohlin, T. THE VALIDITY OF THE REMOVAL METHOD FOR SMALL POPULATIONS - CONSEQUENCES FOR ELECTROFISHING PRACTICES. *Inst. Freshwater Res. Drottningholn Rep.* No. 60. p. 15-18. 1982. SFA 28(3)
[Dep. Zool., Univ. Gothenburg, P.O. Box 25059, S400 31 Gothenburg, Sweden] The accuracy of the confidence intervals of the removal method (Moran-Zippin's estimator) applied to small populations was investigated by Monte Carlo simulation, using catchabilities in the range of 0.5-0.8 and for 2 and 3 removals. For the two-sample case, the confidence interval is valid for populations down to 200 for catchabilities from 0.5 to 0.7. For 0.8 a population size of 100 may be tolerated. For the three-sample case and catchabilities from 0.5 to 0.7, the confidence interval is reasonably well estimated for populations down to about 50. For a catchability of 0.8, the confidence interval tends to be too narrow for populations smaller than 200. For population sizes above the minimum limites indicated above, the precision is generally acceptable for both cases. For the two-sample case and a catchability of 0.5, the precision may be too low for most applications. The precision is greatly improved, especially for small populations, if an approximately know catchability is used.

83-001959 Bohlin, T.; C. Dellefors and U. Faremo. ELECTRO-FISHING FOR SALMONIDS IN SMALL STREAMS - ASPECTS OF THE SAMPLING DESIGN. *Inst. Freshwater Res. Drottningholm Rep.* No. 60. p. 19-24. 1982. SFA 28(3)
[Dep. Zool., Univ. Gothenburg, P.O. Box 25059, S-400 31, Gothenburg, Sweden] Using simple random sampling of stream sections and applying the removal method to each of the sections, the spatial distribution of juvenile sea trout (*Salmo trutta*) in two small streams was studied using electrofishing. The distributions were contagious with a coefficient of variation in the magnitude of 0.7 for trout of age I+ and older. On the basis of the results, the approximate sampling intensity required to reach varying levels of precision of the mean density estimate was calculated. Stratification with respect to biotope improved the precision. The effect of varying number of removals in each section was studied by numerical experimentation, suggesting a negligible gain in precision for a number of removals exceeding 3, and a small gain from 2 to 3 removals in the case of large total populations. The consequences of the results are put forward in the form of recommendations.

83-001960 Gallastegui, C. AN ECONOMIC ANALYSIS OF SARDINE FISHING IN THE GULF OF VALENCIA (SPAIN). *J. Environ. Econ. Manage.* 10(2):138-150. June 1983. SFA 28(3)

MATHEMATICS, STATISTICAL METHODS, AND MODELING (CONTINUED)

83-001960 CONTINUED
[Dep. Teoría Econ., Fac. Cienc. Econ., Univ. Paris Vasco, Bilbao, Spain]

83-001961 Konobeyeva, V. K. and A. G. Poddubniy. FORECASTING THE DISTRIBUTION OF YOUNG FISH IN A BODY OF WATER. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 22(4):80-87. 1982. SFA 28(3)
[Inst. Biol. Inland Waters, USSR Acad. Sci., Yaroslavl, USSR] An attempt at diagrammatic modelling of the distribution of embryos, larvae and fry of some species of fish in Rybinsk Reservoir, based on the close connection between displacements of the young and of water masses, is presented in this paper. When verifying the acceptability of the calculations put forward, we found a distinct coincidence between the location of hypothetical aggregations and that of actual aggregations, in other words the high resolving power of this method was evident.

83-001962 Luckyanov, N. K.; Y. M. Svirezhev and O. V. Voronkova. AGGREGATION OF VARIABLES IN SIMULATION MODELS OF WATER ECOSYSTEMS. *Ecol. Model.* 18(3-4):235-240. Apr. 1983. SFA 28(3)
[Computation Cent., USSR Acad. Sci., 40 Vavilov St., 117333 Moscow, USSR]

83-001963 Ludwig, D. and R. Hilborn. ADAPTIVE PROBING STRATEGIES FOR AGE-STRUCTURED FISH STOCKS. *Can. J. Fish. Aquatic Sci.* 40(5):559-569. May 1983. In English with French summ. SFA 28(3)
[Inst. Anim. Resour. Ecol., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

83-001964 Myers, R. A. and R. W. Doyle. PREDICTING NATURAL MORTALITY RATES AND REPRODUCTION--MORTALITY TRADE-OFFS FROM FISH LIFE HISTORY DATA. *Can. J. Fish. Aquatic Sci.* 40(5):612-620. May 1983. In English with French summ. SFA 28(3)
[Dep. Biol., Dalhousie Univ., Halifax, NS B3H 4J1, Canada]

83-001965 Reed, R. B. A SIZE STRUCTURED SIMULATION MODEL FOR FISH POPULATION DYNAMICS. *Ph.D. dissertation, Auburn Univ.* 148p. 1982. From Diss. Abstr. Int. B Sci. Eng. 43(10):3085. Apr. 1983. SFA 28(3)
A computer implemented simulation model was developed for use in fish population dynamics research. Stochastic in nature, the model uses size groups rather than age groups as state variables. Density dependent effects are included in the rate functions for growth and natural mortality. The model was applied to the largemouth bass population at Chambers County Public Fishing Lake, Alabama to determine what length regulations were likely to optimize fishing quality. The model provided realistic predictions of numbers of bass caught where no size restrictions were placed on bass harvest, both in terms of numbers and year to year variability. Predictions of catch and yield under various harvest length regulations were found to be consistent with the predictions of other population dynamics models and observations from real system where the regulations had been imposed. Predicted mean annual fishing quality was highest under a slot limit length regulation with the protected size range including fish between 12 and 15 inches in length. All size restrictions on harvest of largemouth bass simulated increased fishing quality over that of an unregulated fishery. The length of time a length regulation must be in effect before its effect on fishing quality can be evaluated was investigated. Although the predicted time required for

MATHEMATICS, STATISTICAL METHODS, AND MODELING (CONTINUED)

83-001965 CONTINUED fishing quality to reach a new equilibrium after imposition of a length regulation was highly variable, in only 67% of a total of 168 simulations did fishing quality reach equilibrium in 5 years or less. It is therefore suggested that evaluation of the effect of a regulation on fishing quality should not be attempted until the regulation has been in effect for at least five years.

83-001966 Schweigert, J. F. and J. R. Sibert. OPTIMIZING SURVEY DESIGN FOR DETERMINING AGE STRUCTURE OF FISH STOCKS: AN EXAMPLE FROM BRITISH COLUMBIA PACIFIC HERRING *(CLUPEA HARENGUS PALLASI)*. *Can. J. Fish. Aquatic Sci.* 40(5):588-597. May 1983. In English with French summ. SFA 28(3)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

83-001967 Sundby, S. A ONE-DIMENSIONAL MODEL FOR THE VERTICAL DISTRIBUTION OF PELAGIC FISH EGGS IN THE MIXED LAYER. *Deep-Sea Res. A Oceanogr. Res. Pap.* 30(6):645-661. June 1983. SFA 28(3)
[Inst. Mar. Res., N-5011 Bergen-Nordnes, Norway] A one-dimensional model describing the vertical distribution of pelagic fish eggs confined to the mixed layer is developed. The physical properties of pelagic fish eggs and a method for computing the corresponding ascending velocity are described. The model is applied to measurements taken from the literature of the vertical distribution of three pelagic fish eggs species: plaice eggs from the southern North Sea, mackerel eggs from the central North sea, and cod eggs from the coast of northern Norway. The effect of wind mixing is demonstrated and a mean vertical eddy diffusivity coefficent is computed from the egg profiles and the ascending velocities of the eggs. A relaton between the wind force and the mean eddy diffusivity coefficient of the mixed layer for wind forces up to 12ms^{-1} is suggested.

83-001968 Swartzman, G. L.; W. M. Getz; R. C. Francis; R. T. Haar and K. Rose. A MANAGEMENT ANALYSIS OF THE PACIFIC WHITING (*MERLUCCIUS PRODUCTUS*) FISHERY USING AN AGE-STRUCTURED STOCHASTIC RECRUITMENT MODEL. *Can. J. Fish. Aquatic Sci.* 40(4):524-539. Apr. 1983. In English with French summ. SFA 28(3)
[Cent. Quantitative Sci. For. Fish. Wildl., Univ. Wash., Seattle 98195]

83-001969 Walker, K. D.; R. B. Rettig and R. Hilborn. ANALYSIS OF MULTIPLE OBJECTIVES IN OREGON COHO SALMON POLICY. *Can. J. Fish. Aquatic Sci.* 40(5):580-587. May 1983. In English with French summ. SFA 28(3)
[Dep. Agric. Econ., Univ. Mo., Columbia 65211]

LAKE MANAGEMENT AND RESEARCH

83-001970 Inskip, P. D. and J. J. Magnuson. CHANGES IN FISH POPULATIONS OVER AN 80-YEAR PERIOD: BIG PINE LAKE, WISCONSIN. *Trans. Am. Fish Soc.* 112(3):378-389. May 1983. SFA 28(3)
[Dep. Epidemiol., Harvard Sch. Publ. Health, 677 Huntington Ave., Boston, MA 02115]

83-001971 Pikhu, E. R. REORGANIZATION OF THE FISHING INDUSTRY AND ICHTHYOCOENOSIS SUCCESSION IN LAKE VYRTS'YARV (ESTONIAN SSR). *J. Ichthyol.* (*Engl. Transl. Vopr. Ikhtiol.*) 22(6):39-44. 1982. SFA 28(3)

LAKE MANAGEMENT AND RESEARCH (CONTINUED)

83-001971 CONTINUED
[Inst. Zool. Bot., Estonian SSR Acad. Sci., Tartu, USSR] Vyrts'yarv is a large, eutrophic, comparatively low-yield pike-perch lake in Central Estonia. Twelve to 15 years ago ruffe and small perch, control of which was attempted unsuccessfully by intensive trawl fishing, predominated in the lake. The existence of a set of measures (regular stocking of the lake with young eels, banning of trawl fishing, intensified protection of valuable fish) brought about the succession of the ichthyocoenosis, and fishes of little value (particularly the ruffe) were largely replaced by valuable fishes (in particular the pike-perch and eel). Although as a result of this, the total catch from the lake decreased, its value increased by 2.2-2.6 times.

83-001972 Tonn, W. M.; J. J. Magnuson and A. M. Forbes. COMMUNITY ANAYLSIS IN FISHERY MANAGEMENT: AN APPLICATION WITH NORTHERN WISCONSIN LAKES. *Trans. Am. Fish. Soc.* 112(3):368-377. May 1983. SFA 28(3)
[Cent. Limnol., Univ. Wis., Madison 53706]

RIVER AND STREAM MANAGEMENT AND RESEARCH

83-001973 Aiken, J. D. OPPORTUNITIES TO PROTECT INSTREAM FLOWS IN NEBRASKA AND KANSAS. *U.S. Fish Wildl. Serv.* FWS/OBS-83/02. xxi + 57p. Feb. 1983. SFA 28(3)
[3400 Dudley St., Lincoln, NE 68503]

83-001974 Aiken, J. D. OPPORTUNITIES TO PROTECT INSTREAM FLOWS IN MINNESOTA AND IOWA. *U.S. Fish Wildl. Serv.* FWS/OBS-83/07. xviii + 64p. Mar. 1983. SFA 28(3)
[3400 Dudley St., Lincoln, NE 68503]

83-001975 Cline, L. D. and J. V. Ward. EFFECTS OF DAM CONSTRUCTION ON THE DOWNSTREAM MACROINVERTEBRATE COMMUNITY. *J. Colo.-Wyo. Acad. Sci.* 14(1):16. Apr. 1982. Abstract only. SFA 28(3)
[Dep. Biol., Colo. State Univ., Fort Collins 80523] During the ice-free seasons of 1978-1980, a study was conducted to evaluate the effects of reservoir construction on the macroinvertebrate community of a subalpine stream 110 km northwest of Fort Collins. Immediately downstream from construction, suspended solids increased tenfold and substrate mean particle size was reduced 50% because of sedimentation. Macroinvertebrate density and biomass decreased as much as 85% and species composition changes occurred. Abiotic factors and benthic standing crop exhibited rapid recovery at downstream sites, but species composition changes recovered to a lesser degree. From the perspective of functional feeding groups, the altered stream conditions engendered by reservoir construction adversely affected scrapers while favoring collectors. Shredders usually comprised less than 10% of total macroinvertebrate density and did not display a consistent response to construction activities. Predators increased in relative abundance immediately below dam construction, suggesting a shift in predator-prey interactions which warrents further investigation.

83-001976 Fittkau, E. J. and F. Reiss. VERSUCH EINER REKONSTRUKTION DER FAUNA EUROPÄISCHER STRÖME UND IHRER AUEN. [AN ATTEMPTED RECONSTRUCTION OF THE FAUNA OF LARGE RIVERS AND FLOOD PLAINS OF EUROPE.] *Arch.*

RIVER AND STREAM MANAGEMENT AND RESEARCH (CONTINUED)

83-001976 CONTINUED *Hydrobiol.* 97(1):1-6. 1983. In German with English summ. SFA 28(3)
[Zool. Staatssammlung, Marie-Ward-Str. 16, D-8000 München 19, West Germany]

83-001977 Foster, S. Q. and J. T. Windell. ECOLOGICAL CHARACTERISTICS OF AN ALPINE-SUBALPINE SECOND ORDER STREAM. *J. Colo.-Wyo. Acad. Sci.* 14(1):14. Apr. 1982. Abstract only. SFA 28(3)
[Dep. EPO Biol., Univ. Colo., Boulder] The purpose of this study was to characterize ecologically an alpine-subalpine second order stream in the front range of Colorado. Baseline data were collected on physical habitat, invertebrate species composition, and the fish population, which will serve as a benchmark against which future ecosystem changes can be compared. North Boulder Creek begins as a first order stream near the Continental Divide at the Arikaree Glacier (3786 m) and forms a connecting link between the six alpine lakes of the Green Lakes Valley, the Boulder City watershed and supply. This study was located at an alpine-subalpine transition zone extending from Lake Albion (3347 m) to Silver Lake (3115 m), a decrease of 232 m over 2.6 km. Fish migration with North Boulder Creek and between those lakes containing fish populations is prevented by natural barriers. Electrofishing surveys revealed two cutthroat trout (*Salmo clarki*) and a population dominated by small brook trout averaging 44 g and 151 mm. The largest fish captured was 101 g (.10 lb) and 223 mm (6"). Population estimation indicated 1.5 kg and 29 trout/100 m, or 38 kg/ha and 725 fish/ha. Historic evidence indicates that the threatened greenback cutthroat trout, *Salmo clarki stomias* was the only original native fish in the watershed. Data from this study indicated displacement of *S. c. stomias* by the non-native eastern brook trout. *S. c. stomias* appears to lack the resiliency and adaptability required to coexist with introduced species.

83-001978 Kornman, L. E. MUSKELLUNGE STREAMS INVESTIGATON AT KINNICONICK AND TYGARTS CREEKS. *Ky. Dep. Fish Wild. Resour. Bull.* No. 68. 62p. June 1983. SFA 28(3)
Biological, chemical, and physical characteristics were determined at two native muskellunge *(Esox masquinongy)* streams, Kinniconick Creek and Tygarts Creek, in 1980-81. This study was carried out as part of Dingell-Johnson Project Number F-50 to determine the management potential of developing the muskellunge fisheries in muskellunge streams and evaluate the impact of stocking fingerling muskellunge in 1973, 1976, and 1979. The fish population structure was determined by sampling with a boat-type electrofishing unit. Water quality conditions ere recorded and benthic macroinvertebrates were sampled seasonally. Thirty-five muskellunge were captured at Kinniconick Creek and 59 muskellunge were taken from Tygarts Creek during the two-year study. The mean catch rates for muskellunge at Kinniconick Creek were 0.5 fish per hour and 2.9 fish per mile. Muskellunge grew to a total length of 11.4 inches at age I, 17.6 inches at age II, 22.2 inches at age III, 26.3 inches at age IV, 30.1 inches at age V, and 33.1 inches at age VI in Kinniconick Creek. The total lengths for muskellunge from Tygarts Creek were 11.3, 17.9, 22.7, 27.0, 30.8, and 35.8 inches at ages I-VI, respectively. The mean annual exploitation rate on tagged muskellunge was 15% at Kinniconick Creek and 21% at Tygarts Creek. There were more muskellunge captured from year classes belonging to 2 of the 3 years of stocking at each stream than from unstocked years at both streams, except for the 1975 year class at Kinniconick Creek and the 1980 year class at Tygarts Creek. In order to maintain a more consistent recruitment from each year class of muskellunge in these two streams, an annual supplemental stocking of one 7-9 inch muskellunge per 2 acres of muskellunge pool habitat is recommended. Future muskellunge habitat in the form of fallen trees should be ensured by the protection of trees within the riparian zone near the shoreline of each steram.

RIVER AND STREAM MANAGEMENT AND RESEARCH (CONTINUED)

83-001979 Scott, S. J. HABITAT ANALYSIS AND INFLUENCES ON THE ECOLOGY OF BROOK TROUT (*SALVELINUS FONTINALIS*) IN CEDAR CREEK, MICHIGAN. *M.S. thesis, Cent. Mich. Univ.* 81p. 1982. From Masters Abstr. 21(2):133. 1983. SFA 28(3)

This study investigates the effects of channelization and livestock farming practices on the ecology and habitat of brook trout (*Salvelinus fontinalis*) in Cedar Creek, Isabella County, Michigan. The upstream tract has been channelized and is used as pastureland. The lower tract is relatively unperturbated. Brook trout were found in both portions throughout the summer although they were significantly higher in biomass in the downstream tract compared to the pastureland tract. Age distribution differed between segments. These trout demonstrated no preference for cover during June and August sampling but pastureland trout did show a preference for cover during October. A longitudinal zonation, species composition changing with changes in habitat, was found for the invertebrate community. Food organisms also demonstrated a longitudinal zonation. The pastureland substract was highly organic but the downstream portion was characteristically gravel and rubble, providing adequate substrate for successful spawning.

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[Dep. Biol., Colo. State Univ., Fort Collins 80523] Regulated streams located in six major drainage basins of Colorado were studied as part of an ongoing investigation to determine the effects of impoundment on the ecology of mountain streams. Zoobenthos diversity was consistently reduced below reservoirs, whereas the effects of regulation on standing crop and community structure were variable. Although upstream sites had relatively abundant populations of Plecoptera, few were found in regulated sections. Only 9 of 19 taxa of Ephemeroptera and 6 of 13 taxa of Trichoptera occurred in regulated stream segments. Diptera, Coleoptera, and Oligochaeta showed greater tolerance than the aforementioned taxa to the modified environmental conditions induced by stream regulation. Odonata, Amphipoda, and Hirudinea were collected exclusively in regulated sections. Filamentous algae dominated the aufwuchs below reservoirs, while diatoms were predominant at upstream sites. Comparisons of downstream to upstream sites based on combined data from all drainage basins indicated that zoobenthos and phytobenthos standing crops were greatly enhanced by conditions in regulated stream segments. The considerable differences in effects of individual reservoirs appeared to relate to reservoir control variables, such as the pattern and depth of discharge which ultimately determine thermal and flow regimes in regulated streams.

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[Bioresour. Cent., Desert Res. Inst., P.O. Box 60220, Reno, NV 89506] The fish population of Ruth Reservoir, California, was sampled every two weeks with variable mesh gill nets from May 1974 through May 1975. Fish were captured in the following order of numerical abundance: Humboldt sucker (*Catostomus humboldtianus*), golden shiner (*Notemigonus crysoleucus*), brown bullhead (*Ictalurus nebulosus*), white catfish (*I. catus*), rainbow trout (*Salmo gairdneri*), and largemouth bass (*Micropterus salmoides*). The three most abundant species made up about 95 percent of total numbers and weight. All species exhibited a similar cyclic temporal availability pattern: catch rates increased to a maximum during summer and fall and decreased during winter and spring. Environmental variables with the most pronounced relationships to fish catches were temperature (direct) and turbidity (inverse).

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Canada: Ontario: Lohi Lake
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Canada: Ontario: Niagara River
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